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GROUND SQUIRREL CONTROL, FORT ORD COMPLEX FORT ORD, CALIFORNIA.(U)

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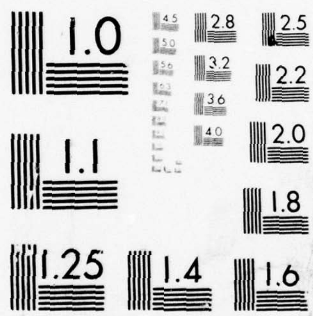

MICROCOPY RESOLUTION TEST CHART

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LEVEL

Final
ENVIRONMENTAL IMPACT STATEMENT
April 1977

GROUND SQUIRREL CONTROL FORT ORD COMPLEX, CALIFORNIA

the Environmental Protection Agency's current program to evaluate the effects of 1080 on nontarget species will be monitored. However, if there is any demonstrated positive plague serology in ground squirrels or fleas, I intend to institute immediate quarantine and treatment of these areas to include ground squirrel and flea control in compliance with the Army's plague control contingency plan using whatever means are necessary.

Robert L. Kirwan

ROBERT L. KIRWAN
Major General, USA
Commanding

DEPARTMENT OF THE ARMY

HEADQUARTERS
7th Infantry Division and Fort Ord
Office of the Commanding General
Fort Ord, California 93941

STATEMENT OF FINDINGS

FINAL ENVIRONMENTAL IMPACT STATEMENT
APRIL 1977
GROUND SQUIRREL CONTROL
FORT ORD COMPLEX, CALIFORNIA

1. I have reviewed and evaluated, in light of the overall public interest: the data and information contained in the Environmental Impact Statement; other documents concerning the plague threat and the proposed action of controlling ground squirrels on the Complex; and the view of other agencies, organizations, and individuals on the environmental and other impacts associated with control of ground squirrels on the Fort Ord Complex, California. The possible consequences of the proposed and alternative methods of controlling ground squirrels have been studied and evaluated for public health effects, efficacy of the approach to control, environmental effects, economic effects, effects on the Army's mission, and legal requirements.

2. I find that the Environmental Impact Statement meets or exceeds the requirements of the National Environmental Policy Act; that the proposed action is based on a thorough analysis and evaluation of the available information; that the various proven effective and practicable alternatives have been evaluated in light of their cost and desired rapid control of the high ground squirrel populations; that the proposed action is biologically sound and justified on the basis of good preventive medicine; that potential adverse environmental impacts are minor for the proposed action and I find that, although apparently minor, the impacts of the secondary effects of 1080 are not precisely known and are being addressed by EPA in a major study in California; that a less controversial rodenticide, zinc phosphide, although less effective, can be used to reduce the ground squirrel populations to acceptable levels at least for a time.

3. On balance, the overall public interest would presently best be served by the use of Alternative 2 of the proposed action using zinc phosphide with no aerial rodenticide dispersal to initially control ground squirrels on the Fort Ord Complex. Careful monitoring and surveillance will be conducted concurrent with this controlled operation, and additional testing will be undertaken to explore the feasibility of other management practices which have been identified. In addition,

ERRATA SHEET

Page 94, paragraph 1: The stocking rate shown as 13,500 AUMs should read 2,700 AUMs.

Page 94, paragraph 2: The stocking rate shown as 13,500 AUMs should read 2,000 AUMs.

Page 151: The category Summary is a sub-heading of Biological Control and not a sub-heading of the category Predators.

Page 155: The category Other Insecticides is a sub-heading of Methods of Flea Control and not a sub-heading of the category DDT.

Page 162: The category Squirrel Control is a sub-heading of Areas of Human Activity and not a sub-heading of Description of Treatment and Application Methods.

Page 189: Historical/Archeological Resources heading should be inserted at top of page.

Page 213: Correct columns 7 and 8 for Alternative 3. Place -2 in each column with reference to the Environmental Element "Energy".

DEPARTMENT OF THE ARMY

HQ, 7TH INFANTRY DIVISION, FORT ORD

9 FINAL ENVIRONMENTAL IMPACT STATEMENT

6 GROUND SQUIRREL CONTROL, FORT ORD COMPLEX

Fort Ord, California

11 ~~April~~ 1977

12 428p.

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Approved By:

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PHOTO CREDITS

[1] Jones & Stokes Associates, Inc.
[2] U. S. Army Medical Laboratory, Fort Baker, California
[3] T. Salmon, Research Associate, U. C. Davis
[4] Cover: Rex Marsh, Specialist in Vertebrate Ecology, U. C. Davis

Summary

GROUND SQUIRREL CONTROL ON THE FORT ORD MILITARY COMPLEX

( ) Draft (X) Final Environmental Statement

Responsible Office: Fort Ord, California (ATTN: Col. C. L. McNeill) (Phone: 408-242-2806)

1. Name of Action: (X) Administrative ( ) Legislative

2. Description of the Action:

It is proposed to significantly reduce ground squirrel populations occupying large areas of grassland and woodland-grassland upon Fort Ord, Fort Hunter Liggett and Camp Roberts located in the Counties of Monterey and San Luis Obispo in the central coastal area of California.

These ground squirrels constitute a large potential reservoir for sylvatic plague; have caused damage to military structures and facilities; damaged crops on adjacent private lands; and compete with other wildlife and with domestic stock for food.

Ground squirrel control (using 1080), formerly in effect upon these areas, was last applied in 1970 and has not been resumed since Executive Orders #11643 and #11870 prohibited the use of secondary poisons for pest control upon federal lands. Present ground squirrel control measures are limited to anti-coagulants and zinc phosphide applied only within 200 yards of occupied structures.

Large-scale ground squirrel control measures using 1080 (a poison which has potential secondary hazards) have been used on private lands adjacent to the military lands for many years, but squirrels from the military lands are claimed to reinfest the treated private lands, causing crop damage and rendering the ground squirrel control program on private lands ineffective.

Rodents and carnivores have been collected on Fort Hunter Liggett during 1976 and serological results have demonstrated that a number of carnivores show a positive reaction for plague, indicating that a source of the plague organism is present on military or adjacent lands. The Surgeon General's Office and the California Department of Public Health recommend that control of ground squirrels and flea vectors be carried out in areas of significant human use.

A number of grazing leases have been issued for the military lands, and there is considerable controversy with respect to the amount of damage to vegetation which the ground squirrels cause. If the ground squirrel population were reduced, the range could support more livestock or desirable wildlife such as deer. On the other hand, there is a question as to whether grazing should be continued at present levels, since a reduction in grazing pressure may result in a change of range conditions that may be capable of supporting additional wildlife other than ground squirrels. This factor of range use may be considered with respect to minimizing fire hazards on the military lands.

The proposed action would treat the open range ground squirrel habitat at Fort Hunter Liggett and Camp Roberts with 1080-treated bait from the air. Retreatment with 1080 is anticipated every 2-3 years if at that time an emergency can be shown to exist. Other methods of control, including range management may be approporiate, as determined by range studies now under way on the Fort Ord complex and by ground squirrel control studies now under way in Tulare County. It is estimated that a total of 4,475 acres at Fort Hunter Liggett and 1,950 acres at Camp Roberts will be baited with 1080. Fort Ord will not be aerially treated with 1080. Zinc phosphide would be applied by hand to open-range ground squirrel habitat on Fort Ord. This action would be supplemented by using anticoagulants, zinc phosphide and fumigants to treat ground squirrel concentrations in areas of human use (accompanied or preceded by flea control using carbaryl dust) and near structures and facilities. The action would be conducted in cooperation with the Department of Interior, California Department of Fish and Game, California Department of Public Health, and the Counties of Monterey and San Luis Obispo. In addition the resources of the plague center at the Center for Disease Control in Fort Collins, Colorado, the Letterman Army Research Institute in San Francisco, and the Army Environmental Hygiene Agency, Fitzsimmons Army Medical Center, Denver, Colorado will be called upon.

3. Summary of Impacts:

Environmental

The proposed action will significantly reduce the population of ground squirrels upon the Fort Ord military complex. The reduction of ground squirrel numbers will have no significant effect upon ground squirrels outside the treated areas, and probably at least 10 percent of the present population on military lands will remain following the proposed action.

The major beneficial impact will be a significant reduction in the threat to human health (plague).

The action will result in less damage to structures and facilities, less damage to crops on adjacent private lands, and a lessening of competition for forage on grazing lands. It will improve the relations between the Army and the community.

The population of other seed-eating rodents such as meadow voles, kangaroo rats and field mice, and of seed-eating birds such as doves, quail, and songbirds will probably be reduced due to primary poisoning. Carnivores may also be affected due to secondary poisoning.

Adverse Environmental Effects

Adverse effects may include a loss of some coyotes, bobcats, domestic cats and dogs, and possibly (though unlikely) kit foxes and mountain lions. Loss of seed-eating birds such as quail, doves and songbirds will be minimal. At the concentrations involved, no adverse effects are expected upon condors, vultures or raptorial birds. Seed-eating rodents will be lost. The loss of ground squirrels and other rodents will reduce the prey food base for predators; however, this is not considered significant since the ground squirrel is relatively unavailable due to its habits of aestivation and hibernation.

4. Alternatives:

The following alternatives have been considered:

- Substitution of zinc phosphide for 1080. This would meet ground squirrel control objectives, but would be less efficient.

- Reduction in the area of open range which would be treated. Continue to treat with 1080 or zinc phosphide a 1-mile wide buffer zone of squirrel habitat adjacent to private crop lands and around cantonments, bivouacs and other areas of human use

or of special concern (dams, roads, etc.). Continue to treat the areas of human use or of special concern with anticoagulants, zinc phosphide, fumigants and carbaryl (as necessary for flea control). This alternative would achieve control objectives with the minimum amount of adverse impacts to the nontarget species, but there would remain the problem of constant reinvasion of the treated areas by ground squirrels from the untreated areas.

- Trapping, flooding, introduction of predators, destruction of burrows, etc., were considered but not developed since their use on a large scale did not appear feasible.

- No action. The present hazard to health and damage to crops and structures will continue at an estimated minimum cost of $5,500 per year for repair and maintenance on Fort Hunter Liggett alone, and a possible crop damage of over $700,000 per year.

5. Federal, state and local agencies from which:

a. Comments were requested, for draft statement:

<u>Federal</u>
Department of Interior
Department of Transportation
Department of Agriculture
Department of Defense
Department of Health, Education and Welfare
Environmental Protection Agency

<u>State</u>
California Department of Fish and Game
California Department of Public Health
California Department of Food and Agriculture
State Clearinghouse

<u>Local</u>
San Luis Obispo County Agricultural Commissioner
Monterey County Agricultural Commissioner

b. Comments received, for final statement:

<u>Federal</u>
Department of Interior (Fish and Wildlife Service)
Department of Transportation (no comments)
Department of Agriculture (Soil Conservation Service)
Department of Defense (U. S. Army Environmental Hygiene Agency, U. S. Marine Corps, U. S. Army FORSCOM, Fort McPherson, Georgia, U. S. Army, Fort Hunter Liggett)
Department of Health, Education and Welfare (Office of Environmental Affairs)
Environmental Protection Agency (Region IX)

State
All responses coordinated through State Resources Agency in one letter

Local
San Luis Obispo County Agricultural Commissioner
Monterey County Agricultural Commissioner

6. Draft statement to CEQ: February 5, 1977

7. Final statement to CEQ:

INTRODUCTION

GENERAL PROJECT DESCRIPTION

Fort Ord, Fort Hunter Liggett and Camp Roberts support multiple-use recreational programs, and each installation has a natural resource conservation program. However, the primary use of each installation is military training. All other uses are secondary. The present high populations of ground squirrels and the subsequent potential health hazard and damage they represent interfere with the U. S. Army's primary mission and cause damage to the property of surrounding landowners. To remedy these problems, the Army has developed a ground squirrel control program which involves the use of several poisons, applied by a variety of methods. The poisons projected for use are 1080 (sodium monofluoroacetate), zinc phosphide, diphacinone (anticoagulant) and fumigants. Following recommendations of health officials the Army also plans to control fleas with an insecticide, carbaryl, prior to or in conjunction with the application of poison bait.

Sodium monofluoroacetate (1080)-treated grain bait will be applied aerially across open rangeland on Fort Hunter Liggett and Camp Roberts in 1977 following the guidelines of Marsh (1967). Only the active colonies of squirrel-infested acreage will be treated. This active colony acreage is estimated to be 4,475 acres on Fort Hunter Liggett and 1,950 acres on Camp Roberts, for a total of 6,425 acres actually treated with 1080 grain bait. 1080-treated bait (0.08 percent) will be applied at the rate of 6 pounds per swath acre. Fort Hunter Liggett will receive a total of 26,850 pounds of bait (2,148 pounds 1080) and Camp Roberts a total of 11,700 pounds of bait (936 pounds 1080). Compound 1080 will not be used at Fort Ord. Followup treatment with 1080-treated grain (or other control measures) will be conducted every 2-3 years wherever squirrel populations recover or reinfestation occurs. Other control measures may be based upon information now being developed in range studies on the Fort Ord complex, and by ground squirrel control studies underway in Tulare County.

Zinc phosphide grain bait will be applied by hand to squirrel colonies in the open rangeland and maneuver areas of Fort Ord. Zinc phosphide will also be used within the city limits of Fort Ord in areas such as the football field and vacant lots. Zinc phosphide will also be used as a long-range control measure on all three installations along road banks and dam faces whenever damage by squirrels occurs.

Diphacinone or other anticoagulants offered in bait boxes, and fumigants such as carbon bisulphide, methyl bromide or gas cartridges will be used to control squirrels in cantonment areas or other areas of human use. Diphacinone and fumigants will also be used in areas near water impoundments on all three installations.

To control ground squirrel fleas, carbaryl dust will be applied within burrows in cantonment areas or other sites (including open range) having high human use on all three installations on the orders of the Surgeon General. Flea control where needed will precede or accompany application of poison baits.

A more detailed discussion of the project description covering the specific control measures, including amounts of toxicants, methods of application, manpower, equipment and safety measures, etc. is found in the section -- Proposed Action and Alternatives - Impacts and Mitigations (pages 125 to 214).

Military Mission

Fort Ord, Fort Hunter Liggett and Camp Roberts are Department of Army installations owned and managed to further the Army's overall military mission.

Fort Ord is responsible for training of the 7th Infantry Division. Fort Ord also provides support to the Combat Development Experimental Command, the Defense Language Institute, plus active and reserve military programs in central and southern California.

Fort Hunter Liggett's primary mission is to support training and maneuvers of the 7th Infantry Division and field experimentation of the Combat Development Experimental Command.

Camp Roberts is presently licensed to the California National Guard and is used primarily for National Guard and Reserve component training. The 7th Infantry Division has also recently begun to use the camp for training and maneuvers.

Other Land Uses

Based upon the multiple use concept, the military lands are also used for a variety of outdoor recreation pursuits. One of the principal activities is a hunting and fishing program. Other outdoor recreation programs include golfing, dog field trials, riding, swimming and picnicking, wildlife observation and photography, organized sports, i.e., baseball.

The military lands are also used to provide income through grazing leases for sheep and cattle and honey bee leases.

Natural Resource Conservation Program

Fort Ord and Fort Hunter Liggett have natural resource conservation programs. The Fort Ord program was started over 20 years ago. Both installations have received national Department of Army recognition for their activities. The programs include water and soil conservation; forestry; fish and wildlife protection and enhancement elements as well as the user programs indicated above.

Ground Squirrel Problems

The beechey ground squirrel is considered by many as one of the most destructive pests of California, annually causing millions of dollars of damage to agricultural crops, grazing lands and man-made structures. The burrowing habits of these animals are the primary cause of structural damage to roads, dams and buildings and have been cited as a means of accelerating soil erosion (DeVos, 1969). Their foraging activities on grazed lands, as with livestock, often leads to an alteration of plant species and density of cover which enables them to become more abundant and to compete even more with livestock for forage (Howard, 1953). In addition, the ground squirrel acts as host for vectors carrying rodent-borne diseases (including plague) communicable to humans.

Various ground squirrel control laws and programs have been in effect in California for many years (Jacobsen, 1962). Major control efforts have been initiated and promoted by federal, state and local government. Monterey County's 1908 ordinance, which has not been repealed, authorizes fines or imprisonment for failure to kill ground squirrels.

Control by Army

Ground squirrel problems have occurred on three U. S. Army installations in California -- Fort Ord, Camp Roberts and Fort Hunter Liggett. Several different control measures were used in early programs, including zinc phosphide, strychnine, cyanide, thallium sulfate and periodic trapping and shooting. During World War II a new rodenticide, sodium monofluoroacetate (1080), came into use and replaced most of the previously used rodenticides. Initially, the lands were treated with zinc phosphide and/or 1080-treated grain dispersed near the burrow entrances of active ground squirrel colonies.

However, this procedure was time-consuming and expensive with only limited efficacy and control (Hunter Liggett Military Reservation, report, 1968). With the development of an aerial dispersal procedure for 1080-treated grain, described by Marsh (1967), a more efficient and cheaper method of control was possible. This procedure was used at Fort Hunter Liggett in 1968 and 1969 and at Camp Roberts in 1969 and 1970. Because of less favorable habitat, soil, or climate, the ground squirrel problem at Fort Ord was deemed less serious than at the other two installations; therefore, zinc phosphide was continued as the control measure at Fort Ord.

1972 Executive Order

Due to increasing public awareness concerning the poisoning of wildlife on public lands and the recommendations published in the Cain report (Cain, et.al., 1972), Executive Order 11643 was issued. Basically the Cain report (entitled Predator Control - 1971) recommends that "immediate Congressional action be sought to remove all existing toxic chemicals from registration and use for operational predator control...that these restrictions extend to those toxicants used in field rodent control whose action is characterized by the secondary poisoning of scavengers... and that the Secretary of Interior disallow use of the aforementioned chemicals in federal operational program of predator and rodent control". As a consequence of the recommendations of this report, the President issued Executive Order 11643 on February 9, 1972, establishing "Environmental Safeguards on Activities for Animal Damage Control on Federal Lands". The Executive Order briefly states that secondary-type poisons may not be used on public lands, unless a finding is made that "any emergency exists that cannot be dealt with by means which do not involve use of chemical toxicants, and that such use is essential: 1) to the protection of the health or safety of human life; 2) to the preservation of one or more wildlife species threatened with extinction, or likely within the foreseeable future to become so threatened; 3) or to the prevention of substantial irretrievable damage to nationally significant natural resources".

To comply with the Executive Order, the use of all chemicals, having the potential for causing secondary poisoning to control ground squirrels, was discontinued on the three military installations.

Action Since 1972

Since the Executive Order 11643 (revised as Executive Order 11870 in 1975), ground squirrel control programs using rodenticides with potential secondary hazards on the Fort Ord complex have been discontinued. Some minor controls are presently being used on all three installations wherever damages by ground squirrels require immediate attention, or where their close proximity to human use areas is deemed a health hazard. Poisons currently being applied by hand on a small-scale basis are diphacinone and zinc phosphide. Carbaryl dust (Sevin) is also being used in the cantonments to control ground squirrel fleas.

The ground squirrel population at Fort Ord, Camp Roberts and Fort Hunter Liggett has increased dramatically, extending over a considerable part of each installation including cantonment and bivouac areas (letter dated April 27, 1973). Neighboring farmers allege that constant reinvasion by squirrels from adjoining federal lands nullifies their control measures and causes serious economic crop losses. Monitoring the rodent and predator populations has produced serological evidence of plague foci on the installations or in the vicinity of the military lands (letter from Surgeon General, dated June 11, 1976). The Director of the Department of Health, State of California (June 30, 1976) has concluded that "it is inevitable that [rodent-borne diseases] will enter the highly susceptible ground squirrel population, and it is imperative that actions be initiated to assure protection of human health". The Surgeon General's office has presented the rationale for the determination that a threat to human health exists (memorandum dated August 17, 1976).

For the Army to effectively reduce the ground squirrel population using these toxicants at these installations, they have requested an exemption from the Executive Order (restricting the use of 1080 and other rodenticides which may cause secondary poisoning). Under the terms of the Executive Order, the Army must make a written finding that such use is essential after consultation with the Environmental Protection Agency (EPA), Health, Education and Welfare (HEW) and the Departments of Agriculture and Interior. It has further been determined that an Environmental Impact Statement (EIS) must be prepared (CEQ [Peterson], August 24, 1976).

In Monterey County several poisons and methods are used on private lands to control ground squirrels. These include 1080 applied aerially or by hand, under the supervision of the County Agricultural Commissioner, zinc phosphide applied by hand, diphacinone, carbon bisulphide, methyl bromide, and gas cartridges. In 1975, 1080 bait (76,064 pounds) and diphacinone bait (29,422.5

pounds) were the two most commonly used rodenticides. The majority of 1080 bait was applied by hand. Of 91,340 acres flown with 1080, only 2.4 percent (2,247 acres) were actually treated with poison bait (California Department of Food and Agriculture, 1976).

San Luis Obispo County uses only 1080 grain bait to control ground squirrels. In 1975 a total of 99,942 pounds were used. In 1968, of 379,819 acres flown with 1080 bait, only 3.7 percent (14,049 acres) actually had bait on the ground (San Luis Obispo County, 1968).

San Luis Obispo County Agricultural Commissioner supervises the use of 1080 grain bait to control ground squirrels on private lands. Diphacinone is available commercially for use to control ground squirrels. Zinc phosphide is not normally used because of its limited effectiveness.

ENVIRONMENTAL SETTING

Regional

This section provides physical, biological and socio-economic information on the areas of Monterey and San Luis Obispo Counties as general background for the region where Fort Ord, Fort Hunter Liggett and Camp Roberts are located (Figure 4). More site-specific environmental information follows for each of the Army installations.

Climate

The prevailing climatic conditions associated with the North Central Coast Basin and typical of the Fort Ord area are cool, dry summers, mild winters and light annual precipitation. During the summer months the Pacific Subtropical High (a high pressure ridge) lies over the ocean to the west. Air descending from this high produces the moderate northwest to west winds that cross the coast during the summer months (Unger, 1975).

Upwelling cools the air offshore, causing frequent fog during the night and early morning hours. Toward the end of summer the fog becomes less frequent. During the transition season of fall the westerlies shift southward through California, and frontal passages may produce showers and rain. Generally, about 90 percent of the precipitation will occur from November through April. Winters are mild but there is considerably more change in weather than during the warmer months. Tables 1 and 2 describe the mean monthly recording (1971-1975) of temperature and precipitation characterizing the areas near each installation.

The climatic pattern of the South Central Coast Basin is typical of Hunter Liggett, Camp Roberts and the associated interior valley. Summers are warm and dry, and winters are cool and humid (Kinney, 1975). Generally the maximum temperature for the North and South Central Coast Basin occurs during the morning hours preceding the sea breeze in the mid or late morning. The summer maximum usually occurs in September or October after the seasonal weakening of the sea breeze and the persistent fog season that usually ends in August.

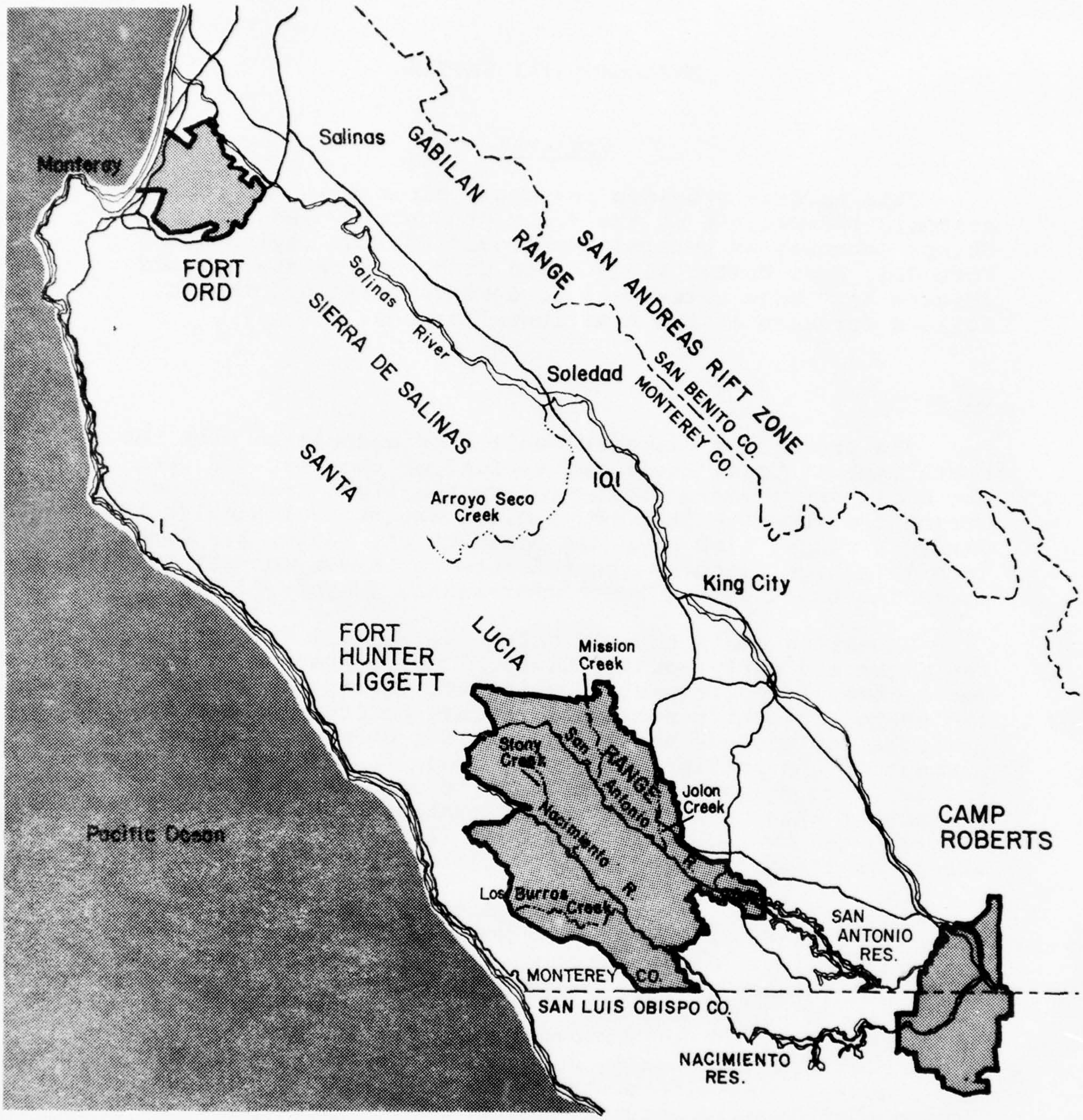


FIGURE 4 REGIONAL MAP

Table 1

MEAN MONTHLY TEMPERATURE RECORDINGS FOR EACH INSTALLATION FROM 1971-1975[1]

	Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Fort Ord	1971	51.4	51.4	52.5	52.1	53.5	57.6	58.3	62.4	64.4	57.1	54.1	47.4	55.2
	1972	48.7	53.4	54.7	54.2	56.1	58.3	62.7	62.7	61.9	61.3	[illegible]	48.3	56.4
	1973	49.7	54.0	51.2	55.7	56.3	61.4	59.5	59.1	61.9	59.4	53.5	51.7	56.1
	1974	49.0	51.0	52.8	54.7	54.2	58.0	60.4	61.1	61.4	61.2	55.3	49.9	55.8
	1975	51.7	51.9	51.8	50.6	56.4	57.1	59.1	60.5	60.0	57.8	53.6	51.2	55.1
Fort Hunter Liggett	1971	47.4	50.1	52.6	54.7	59.9	68.7	75.3	77.2	71.9	60.4	52.4	44.1	59.6
	1972	45.2	52.8	59.0	57.5	64.3	69.5	74.9	73.9	67.3	60.9	51.2	44.0	60.0
	1973	45.0	50.6	49.2	57.1	65.5	71.4	72.7	73.1	68.6	61.7	52.0	49.4M	59.7M
	1974	47.3	49.0	52.8	54.4M	62.5M	69.5M	73.7	73.9	72.4M	64.7	54.5	48.6	60.3M
	1975	49.1	49.8M	51.0	51.0	63.5	68.4	72.1	71.9	72.3	60.9	52.8	49.7	59.4M
Camp Roberts	1971	48.2	51.1	53.6	54.2M	59.3	64.9M	68.1	68.8M	67.5	57.8	51.8	45.5	57.6M
	1972	46.5	54.0	58.9	57.3	61.9	66.8	70.2	69.2	64.7	61.9M	52.4M	M	---
	1973	46.8M	M	M	58.7M	64.6M	69.8M	67.3	67.7	65.8	62.3M	51.3M	M	---
	1974	47.0M	48.1M	M	57.1M	60.2	65.3	68.2	68.0	67.4	63.0M	M	M	---
	1975	45.7M	M	51.9	51.7M	60.5	63.3	65.2	65.2	67.9	60.5	51.8M	49.5	---

[1] Data taken from stations on or near each installation.
M Missing data.
Source: U. S. Department of Commerce, National Oceanic and Atmospheric Administration.

Table 2

MONTHLY PRECIPITATION RECORDINGS FOR EACH INSTALLATION FROM 1971-1975[1]

	Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Fort Ord	1971	1.10	0.50	1.26	1.28	0.29	0.01	0.01	0.16	0.13	0.03	1.82	1.83	8.42
	1972	0.70	0.83	0.02	0.49	0.02	0.02	0.05	T	0.04	1.72	5.02	1.56	10.47
	1973	3.45	5.48	3.21	0.06	0.02	T	T	T	0.05	1.70	4.10	3.00	21.07
	1974	3.67	1.08	5.49	3.74	T	0.38	0.40	0.02	T	1.48	0.47	1.79	18.52
	1975	0.90	3.31	3.15	1.27	0.02	T	0.13	0.55	T	1.02	0.23	0.17	10.75
Fort Hunter Liggett	1971	0.72	0.19	0.49	0.60	0.27	0.00	0.00	0.00	T	0.42	0.55	4.21	7.45
	1972	0.71	0.20	0.00	0.37	0.02	0.19	0.00	0.00	0.03	3.01	4.95	0.88	10.36
	1973	6.23	6.77	2.46	T	T	0.00	0.00	0.00	T	0.84	2.33	1.79	20.42
	1974	8.04	0.07	4.06	0.71	0.00	T	0.00	0.00	T	0.55	0.33	2.96	16.72
	1975	0.05	4.64	3.24	1.29	0.00	0.00	0.02	0.02	0.00	0.60	0.21	0.10	10.17
Camp Roberts	1971	0.35	0.08	0.62	0.67	0.23	0.00	0.00	0.00	0.02	0.01	0.42	3.34	5.74
	1972	0.61	0.22	0.00	0.26	0.00	0.55	0.00	0.00	0.00	1.46	4.28	0.79	8.17
	1973	4.25	6.47	1.94	0.00	0.00	0.00	0.00	T	0.00	0.81	1.47	1.78	16.72
	1974	5.08	0.07	2.49	0.46	0.00	0.00	0.00	0.00	0.00	0.91	0.36	3.05	12.42
	1975	0.14	5.14	3.72	0.92	0.00	0.00	0.08	0.08	0.00	0.63	0.12	0.11	10.94

[1] Data taken from stations on or near each installation.
T Trace.
Source: U. S. Department of Commerce, National Oceanic and Atmospheric Administration.

Generally the temperatures will be warmer farther inland, as evidenced by the higher maximum temperatures recorded at Camp Roberts, especially in areas sheltered by the terrain from the winds and in areas of significant tree cover. In areas of dense overstory precluding the penetration of the sun's rays, cooler daytime temperatures will be recorded; however, nighttime temperatures will be higher in these areas as opposed to open areas where the heat has a chance to escape.

Topography

Monterey and San Luis Obispo Counties are located in the Central Coast Basin. Variation in terrain is the product of uplift that has occurred since the Middle Pleistocene, accompanied by considerable folding and faulting. The trend of the ranges, relative to onshore air mass movement, imparts a marked climatic contrast between the coastal area, exposed summits and interior basins. The variations in terrain, climate and vegetation account for a variety of intricate and different landscapes. The major terrain of the basin is generally expressed in terms of the San Benito and Salinas Valleys and the surrounding mountain ranges of Santa Lucia, Santa Cruz, Gabilan, Diablo, and Sierra de Salinas (Kinney, 1975).

The San Benito Valley is situated between the Gabilan and Diablo Ranges and is the smaller of the two major valleys. Farther north of the San Benito Valley lies the Santa Cruz Range in a nearly straight alignment with the Gabilan Range. The Santa Lucia Range rises abruptly from the Pacific Ocean with hundreds of sharp peaks; the highest peak reaches 5,844 feet. Separating the Santa Lucia from the Gabilan Range is the Salinas Valley, one of the longest and broadest valleys of the Central Coast Basin (Figure 4). The sides of the valley are defined by hundreds of low-rolling, grass-covered hills from 200 to 400 feet high, which make ideal cattle and sheep grazing areas (Monterey County Planning Commission, 1972).

The Salinas River bisects the county, running north from San Luis Obispo County through Monterey County into Monterey Bay. The principal tributaries are the Arroyo Seco, Nacimiento and San Antonio Rivers from the Santa Lucia Range and the San Lorenzo Creek which flows west from the Gabilan Range.

Soils

The soil survey of Monterey County, California (U. S. Department of Agriculture, Soil Conservation Service, 1975), presents general soil associations for a large part of the study area. Soils along the Salinas River and other major streams are formed from sedimentary alluvium on floodplains and from granitic and schist-like rocks. Soils showing these characteristics are Antioch, Arroyo Seco, Clear Lake, Gloria, Mocho and Pacheco. These soils are used primarily for irrigated row crops and dry land pasture.

Uplands underlain by sandstone, shale and sedimentary rocks consist of Gaviota, Gazos, Linne, Los Gatos, Los Osos, McMullen, Nacimiento, Santa Lucia and Santa Ynez soil series. Vegetation consists mostly of annual grasses, forbs and scattered oaks. These soils are well drained and support range, wildlife habitat and watershed-protective vegetation.

Some lower elevations are characterized by aeolian sand dunes and soft marine sediments on uplands. Arnold, Baywood, Garey, Metz, Marlon and Oceano soil series have these features. These soils support range, recreation and military land uses.

Steep bluffs along major rivers consist of soil materials of unconsolidated or weakly consolidated alluvium. The alluvium commonly has gravel, cobblestone and stones. These soils are suited to range and some limited woodland.

Geology

The study area lies within the California Coast Range province, a series of north-northwest mountain ranges and several major structural valleys. The geology of these ranges is extremely complex. Typically, the area consists of old and recent sand dunes, Upper Cretaceous marine, Lower and Middle marine, and Plio-Pleistocene nonmarine sedimentary deposits. Along streams and near the coast are more recent alluvial and stream deposits.

A peculiar feature of the Coast Range province is the abutment of two regions consisting of entirely different core complexes -- the Sur series and quartz diorite to the west, and the Late Jurassic to Late Cretaceous Franciscan Formation to the east. The two unrelated core complexes are separated from each other by an intricate system of fault blocks. The most active in the area is the San Andreas fault, striking approximately N35°W in a nearly straight line in the Coast Range province and extending southward for a total length of about 250 miles from Shelter Cove on the coast of Humboldt County to the Salton Sea (Oakeshott, 1966).

Water Resources

Surface Waters. The Salinas River is the major surface stream in the study area, running north from San Luis Obispo County through Monterey County into the Monterey Bay. The principal tributaries are the Nacimiento and San Antonio Rivers and the Arroyo Seco. Mission and Jolon Creeks are the principal tributaries of the San Antonio River, and Stony and Los Burros Creeks contribute to the Nacimiento River within the boundaries of Hunter Liggett. Small man-made impoundments and ephemeral streams exist on each of the three installations; however, these streams are normally dry during late summer and fall. Nacimiento and San Antonio Reservoirs were constructed in 1957 and 1965, respectively, and are operated by the Monterey County Flood Control and Water Conservation District. The primary purpose of the reservoirs is groundwater recharge in the Upper Valley and Forebay aquifers and flood control in the basins. See Figure 4 for major water sources in the study area.

The lower Nacimiento River below the Nacimiento Dam is located in north central San Luis Obispo County. It flows in a northeasterly direction and joins the Salinas River in south central Monterey County. The total distance is about ten miles, with the upper two miles winding through private land and the lower eight miles bisecting Camp Roberts.

During the wet season, runoff is stored in the reservoir. Releases generally begin between April and July when the flows diminish in the Salinas River. The total capacity of the dam is 350,000 acre-feet, providing an estimated 85,000 acre-feet for use in Monterey County and 17,500 acre-feet in San Luis Obispo County.

The San Antonio Reservoir controls the flow of the San Antonio River. It has a gross storage capacity of 350,000 acre-feet and provides an annual yield of approximately 32,000 acre-feet for groundwater recharge in the Salinas River downstream from Bradley (California Regional Water Quality Control Board, Central Coast Region, 1975).

Groundwater. Groundwater in the Salinas Valley is a mixture of natural surface waters, water released from storage projects, agriculture, municipal and industrial wastewater and sea water. The major sources of recharge to the groundwater basin are the Salinas River and Arroyo Seco. These waters are generally of very good quality with average total dissolved solids (TDS) values of 210 mg/l and 170 mg/l, respectively. Recorded groundwater TDS values range from 300 mg/l to 2,400 mg/l. The following groundwater data were summarized from the Fort Ord Mission Change, unpublished Draft EIS, 1975.

Fort Ord. The groundwater resources of the lower Salinas Valley provide an abundant supply of groundwater in the northern part of Fort Ord. More than 90 percent of the total water taken from the Salinas Valley groundwater system goes to agriculture. The Salinas River marks the southwest side of a clay-layered, confined artesian aquifer condition referred to as the "pressure area".

Under Fort Ord itself the subsurface conditions are difficult to interpret as there are many undulating areas of sand and gravel that have been layed down to varying depths of thickness. There are, however, at least three geographical subunits within the Fort Ord area.

Northern Fort Ord is underlain by the pressure area of the Salinas Valley aquifer described above. The 180- and 400-foot aquifers are both present in this area. In the south-easternmost area, wells are most likely supplied from isolated pockets of water. There is no significant recharge to northern Fort Ord from this south or southeast area. In the Ord Village/Seaside area, there is an almost total lack of data; however, it can be inferred that groundwater in this area is recharged from the local southwest Fort Ord area.

The quality of groundwater at Fort Ord is generally good and is substantially the same at all depths so far tapped by wells in the Salinas Valley and northern Fort Ord.

East of Fort Ord and west of Salinas the 180-foot aquifer contains water with high chloride content and total dissolved solids. In addition, sulfates and bicarbonates as well as calcium, magnesium and sodium are found in this water, indicating a contamination source perhaps distinct from typical saltwater intrusion. The clay cap covering the 180-foot aquifer is thin in this area and apparently groundwater perched on top of the cap finds its way into the aquifer below. There is the possibility of unconsumed irrigation water, some sewage effluent and some industrial wastes entering the aquifer in this area. It is perhaps from these sources that the other pollutants are found. The 400-foot aquifer in this area is not degraded. This is thought to be because the seal layer between the 180- and 400-foot aquifers is more effective than the clay cap above the 180-foot aquifer.

On the west side of Fort Ord, saltwater intrusion has primarily affected the shallow aquifer and led to the development of wells inland in the deeper aquifer.

Fort Hunter Liggett. Water-bearing formations of the HLMR area are the Paso Robles, the Older and Recent Alluvium and an unnamed Tertiary formation. The Paso Robles formation has the best water-producing potential and extends from the surface to 1,000-foot depths in areas northwest of the San Antonio Valley. The alluviums are very permeable, but are shallow and do not produce wells of very great yield. The Monterey formation, essentially non-water bearing, covers a larger portion of the reservation and underlies some of the alluvium. A groundwater geologist concluded that extensive and suitable water-bearing formations do exist within the reservation (Dewante and Stowell, 1967).

Camp Roberts. Camp Roberts is underlain by a major groundwater basin, made up of the Paso Robles and the Cholame Valley basins. The Paso Robles Basin is reported to have a usable storage capacity of 1,700,000 acre-feet. The average withdrawal capacity of wells drawing from the Paso Robles Basin is reported to be 500 gallons per minute, and from the Cholame Valley Basin 1,000 gallons per minute.

Water Quality. The U. S. Geological Survey and the California Department of Water Resources continuously monitor flows in the Salinas River. The Monterey County Flood Control and Water Conservation District records flows in the Main Reclamation Ditch and smaller tributaries to the Salinas River, and maintains flow release data for Nacimiento and San Antonio Reservoirs. These reservoirs regulate downstream flows of the San Antonio and Nacimiento Rivers.

Water quality standards observed in this report are those of the state's RWQCB and the EPA.

The extreme seasonal fluctuations in the surface flow of the Salinas River and the large input of domestic wastewater and agricultural runoff that reach its lower stretches have combined to create adverse water quality conditions. High bacterial counts and pesticide levels and nuisance algal blooms are the major water quality problems.

There are three distinct aquifers of the Salinas River groundwater basin within the northern part of the study area. The estimated safe yield of the 180-foot and the 400-foot aquifers is 78,000 acre-feet per year, and the estimated safe yield of the East Side Aquifer is 19,000 acre-feet per year (Yoder-Trotter-Orlob & Associates, 1973).

The 180-foot and 400-foot aquifer are called pressure aquifers because they are overlain by impermeable material. The East Side aquifer is an unconfined aquifer; if enough groundwater were present, it could rise to ground surface. Quality data for the 180- and 400-foot aquifers are presented in Table 3.

Table 3

GENERALIZED GROUNDWATER QUALITY IN THE SALINAS RIVER BASIN

Characteristic	180-foot Aquifer	400-foot Aquifer
TDS - mg/l	1,414	400
Boron - mg/l	0.6	0.19
Sodium - mg/l	225	41
Chloride - mg/l	243	27
Nitrate - mg/l	0	0
Sulfate - mg/l	624	102

Source: California Regional Water Quality Control Board, Central Coast Region, 1974.

Flora

Monterey and San Luis Obispo Counties contain a wide variety of natural vegetation as a result of the influence of climate, topography and various other factors. The vegetation can be grouped into six general vegetative cover types: coastal strand, riparian, grassland, woodland, scrub-chaparral, and coniferous forest. The coastal strand is characteristically vegetated by succulent ice plants and other beach grasses. Riparian habitat is dominated by willow and cottonwood. This cover type also includes marsh habitat and the associated plant species. Grasslands are typified by annual grasses (such as wild oats, brome and fescues, which have been introduced by man), as well as associated forbs (such as bur clover and filaree). Woodland habitat is characterized by open and closed stands of deciduous hardwoods, such as live and blue oak. Scrub-chaparral habitat consists of the coastal scrub zone dominated by low-growing, woody plants, such as manzanita, and the more arid chaparral of the interior which is characterized by open or closed stands of a great variety of species, which includes coastal sage brush, mountain mahogany and chamise. The coniferous forest cover type includes redwood and closed-cone pine forests along the coast and ponderosa pine or juniper-pinon pine forests of the interior.

Over 40 rare or endangered plant species occur in each county. The rare Monterey cypress and several manzanita species occur only within Monterey County. Several rare lupine and mariposa species are limited in distribution to San Luis Obispo County (California Native Plant Society, 1974).

Fauna

As a result of the diversity of habitat within Monterey and San Luis Obispo Counties, a wide variety of animal life can exist. Each habitat type -- coastal, riparian, grassland, woodland, scrub-chaparral, and coniferous forest -- supports its own complement of animal life. Some animal species may be restricted to a certain habitat type, while others are adaptable to several habitat types.

Along the coast, birds are the most evident form of animal life. Many species of gulls, shorebirds, murres and cormorants, as well as the endangered California brown pelican can be observed along the coast. Marine mammals such as the stellar sea lion and the threatened southern sea otter occur in the coastal waters of both counties.

The complexity of riparian vegetation and the close proximity to water provide suitable habitat for a great number of wildlife species. The reservoirs, streams and ponds on the region provide habitat for many game fishes, such as trout and bass as well as nongame fishes, including minnows and suckers. A list of native and introduced fishes in the Pajaro-Salinas drainage can be found in Moyle (1976). Shrub growth provides cover for a variety of small mammals (rodents, rabbits) and many songbirds and gamebirds (quail, dove, pheasant). The larger trees of this zone contribute nest sites and cover for tree squirrels, as well as many bird species (raptors, songbirds, woodpeckers).

Grassland provides habitat for foraging forms of wildlife (raptors, coyotes, skunks, foxes, rodents and seed-eating birds). Greater value to wildlife occurs wherever grassland joins chaparral or woodland creating an "edge" effect with greater habitat diversity.

Woodlands, often associated with grass or brush understories, provide an important source of food and cover for many species, including the blacktail deer, wild pig, grey squirrel, band-tailed pigeon and wild turkey. The tree canopy provides food and cover for many bird species.

Scrub-chaparral habitat, despite its location in more arid topography, supports populations of blacktail deer, brush rabbits, coyotes, fox and several rodent species. Quail, dove, wild turkey, scrub jays and various songbirds can be observed in this habitat.

The wildlife value of coniferous forests ranges from low in dense redwood forests to high in the less dense ponderosa pine forests. The coniferous forests of both counties provide important habitat for many bird species, including the nuthatch, creeper and stellar's jay. Many mammals (coyotes, mountain lion, bobcats, foxes, deer and bears) inhabit these forests.

All habitat types support many species of snakes and lizards and where water or moisture is present pond turtles and several species of frogs, toads and salamanders exist.

Eight rare and endangered animal species are known to occur in Monterey County (2 mammals, 5 birds, 1 amphibian) and 10 occur in San Luis Obispo County (3 mammals, 6 birds, 1 reptile). One endangered species of butterfly occurs in Monterey County. See Table 4 for a list of rare, endangered or fully protected wildlife of the region.

Land Use

The major uses of the developed land in Monterey County are agriculture, recreation, residential use and industry. Agriculture is the most important source of income for the county. Approximately 290,000 acres are cultivated each year, of which 180,000 acres are irrigated (Monterey County Planning Commission, 1972; Monterey County Department of Agriculture, 1975). Row crops (lettuce, artichokes, peas, and brussel sprouts), suitable to cool climates are grown along the coast and in the lower Salinas Valley. Lettuce, which is valued at over $100 million annually, is the most profitable crop followed by strawberries, celery and tomatoes (Monterey County Department of Agriculture, 1975). Approximately 1,019,000 acres in the foothills and smaller valleys are devoted to dry and irrigated pasture, making livestock raising a primary economic resource.

Important natural resources of the county besides agricultural soils are petroleum, granite, limestone and timber. The San Ardo oil field near King City is the sixth largest producer in the state. There are over 16,000 acres of commercial forest within Monterey County (Monterey County Planning Commission, 1972).

A large portion of Monterey County is comprised of public lands. The Los Padres National Forest extends over 325,000 acres. Additional recreational and open space land includes 13 state parks, beaches and reserves with over 1.5 million visitors in 1974 (California Department of Parks and Recreation, 1974).

San Luis Obispo County is presently dominated by rural and open space uses. The most important land use is agriculture. Approximately 60 percent of the county land is devoted to the less intensive or large-scale uses such as grazing and field crops. The cattle industry, which is valued at over $25 million annually, is the single most important segment of the agricultural

Table 4

RARE, ENDANGERED, THREATENED AND FULLY PROTECTED FAUNA WHOSE PRESENT DISTRIBUTIONS INCLUDE THE STUDY AREA

Common Name	Scientific Name	Status* Federal	Status* State	Comments
BIRDS				
California least tern	Sterna albifrons browni	E	E	Breeds on coast from lower California to San Francisco Bay.
California brown pelican	Pelecanus occidentalis occidentalis	E	E	Occurs on California coast August through November, breeds on Anacapa Island.
California condor	Gymnogyps californianus	E	E	Breeds in coast range in San Luis Obispo, Santa Barbara and Ventura Counties.
Southern bald eagle	Haliaeetus leucocephalus leucocephalus	E	E	Occurs statewide, particularly along coast and in interior around large lakes, reservoirs and wetlands.
Peregrine falcon	Falco peregrinus anatum	E	E	Breeds in california along the coast.
Golden eagle	Aquila chrysaetos		P	Statewide.
MAMMALS				
Morro Bay kangaroo rat	Dipodomys heermanni morroensis	E	E	South side of Morro Bay.
San Joaquin kit fox	Vulpes macrotis mutica	E	R	Foothills of the southern end, western and eastern (in part) edge of San Joaquin Valley. Occurs in 14 counties.
Southern sea otter	Enhydra lutris nereis	T	P	Along coast from Santa Cruz County to Santa Barbara County.
Ring-tailed cat	Bassariscus astutus		P	Statewide in chaparral, rocky ridges, near water.
Mountain lion **	Felis concolor		P	Occurs along coast range of Mendocino to Del Norte Counties, the coast range from Monterey to Ventura Counties, and the southern Sierra Nevada Range in Fresno and Tulare Counties.
REPTILES				
Blunt-nosed leopard lizard	Crotaphytus silus	E	E	San Joaquin Valley to eastern San Luis Obispo County.
AMPHIBIANS				
Santa Cruz long-toed salamander	Ambystoma macrodactylum croceum	E	E	Two locations in Santa Cruz County; one location in Monterey County.
INSECTS				
Smith's blue	Shijimiaeoides enoptes smithi	E		Coastal sand dunes, Monterey County.

* STATUS:

Federal

E — Endangered Species - "means any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man."

State

E — Endangered - "is an animal of a species or subspecies of birds, mammals, fish, amphibians, or reptiles, the prospects of survival and reproduction of which are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease."

R — Rare - "is an animal of a species or subspecies of birds, mammals, fish, amphibians, or reptiles that, although not presently threatened with extinction, is in such small numbers throughout its range that it may be endangered if its environment worsens."

P — Fully Protected - "is an animal of a species or subspecies of birds, mammals, fish, amphibians, or reptiles that by law may not be taken or possessed at any time.

T — Threatened - "means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

Sources: United States Congress, 1973; California State Legislature, 1970; California Department of Fish and Game, 1975 and 1976; U. S. Fish and Wildlife Service, 1976.

** See Figure 32a.

economy. The inland valleys are dominated by grazing and field crops, such as wheat and barley. San Luis Obispo County is the state leader in wheat acreage (Lantis, et.al., 1970). The coastal region provides land for truck crops, which place second in economic importance. Other specialty crops with high economic value per acre include fruits, nuts, citrus and grapes. Over 6,000 acres of almond orchards are located near Paso Robles (San Luis Obispo County Planning Department, 1975).

Important natural resources are petroleum and mineral operations but they comprise only 3,264 acres in the county. Sixteen percent of San Luis Obispo County is public domain or national forest lands. Included are the Los Padres National Forest and 13 state parks, reserves, beaches and historical monuments which received over 6 million visitors in 1974 (California Department of Parks and Recreation, 1974).

Socio-Economics

The economic life of the region is principally dominated by agriculture and its population growth is typical of other agriculturally-oriented counties. The population of the two counties has grown from 357,776 residents in 1969 to 374,437 in 1973. During the same period the percentage of the population in the labor force increased from 156,064 to 164,133, representing 44 percent of total population. The largest single source of employment for the area was government services, employing 7,206 federal civilians and 27,698 military. Other large employment industries are agriculture, forestry and fisheries (13,129), state and local (21,550), construction (6,689), wholesale trade (4,500), eating and drinking establishments (5,659), and retail trade (7,455) (Construction Engineering Research Laboratory, Environmental Impact Computer System, 1976).

Civilian employment at Fort Ord in fiscal year 1975 generated $50.1 million in payroll receipts from military operations. Military payrolls for the same time period totaled $156.1 million. Payments for goods and services purchased off the military reservations amounted to $28.7 million.

The urban areas in the Fort Ord region are served by existing commercial-retail, office or industrial services and facilities. Additional commercial-retail type space at Fort Ord is located within the boundaries of the military reservation, including the main exchange, the commissary, and the clothing sales store. Commercial-retail operations in the vicinity of Fort Ord range from small neighborhood grocery stores to large regional shopping centers with specialty shops. Regional shopping centers are located in Monterey, Salinas and Santa Clara.

Housing. A total of 3,379 family housing units are available on the three installations. The Fort Ord installation maintains five family housing tracts in the Main Post area which consists of 1,941 buildings with 3,264 family units. Noncommissioned officers occupy 2,543 of the family units, the remainder are occupied by 721 commissioned officers and their families. An additional 106 family units are located at the Presidio of Monterey and nine at Hunter Liggett Military Reservation. Camp Roberts is mostly used for National Guard training and does not accommodate military families. These post facilities provide housing for 50 percent of the families associated with the military installations.

At Fort Ord there are 47 permanent barracks which provide space for 8,982 enlisted men without families. An additional 330 temporary facilities designed to house 42 men each are currently being used. Permanent bachelor officer facilities are of two types. There are seven apartment-style buildings having a capacity for 172 occupants, and sixteen temporary buildings currently housing 377 tenants. Additional housing within Monterey and Santa Cruz Counties, accessible to Fort Ord within a 60-minute rush hour commute provides 792 men single-family units, 570 two- and three-bedroom condominiums, 669 one- and two-bedroom apartments. Also, 140 vacant mobile home spaces are located in the Watsonville area.

A study of family housing needs at Hunter Liggett is presently being performed. The exact magnitude of future housing for Hunter Liggett is to be established.

Schools. Approximately 30 percent (105,362) of the population in the two counties attend school. The Monterey Peninsula Unified School District presides over the five schools within the boundaries of Fort Ord as well as schools in the areas adjacent to the installation. Federal funds applied to the Monterey Peninsula Unified School District during the 1975 fiscal year totaled $3.97 million. Pacific Grove School District received $45,000 and Carmel District was given $14,000. All other school districts received a total of $100,000. At present, 3,500 elementary students and 1,200 junior high students are located within the boundaries of Fort Ord.

The nearest schools available for Hunter Liggett dependents are San Antonio Elementary School at Lockwood and King City Union High School at King City. The nearest schools to Camp Roberts are in the Paso Robles area (Department of Army, Fort Ord Mission Change, 1976).

Transportation. The Fort Ord complex is serviced by several highways and airports. Major roadways leading to Fort Ord are State Routes 1, 68 and 156 and U. S. Highway 101. One commercial and municipal airport is located in Monterey and Salinas respectively. Major routes servicing Fort Hunter Liggett are Highway 101 and State Highway 198 connecting Highway 101 with Interstate 5 through Coalinga. County roads G14 and G18 (Jolon Road) from King City and Bradley, respectively, lead to Fort Hunter Liggett from Highway 101. One small municipal airport is located in King City. Camp Roberts is serviced by Highway 101 and State Routes 46 and 41 connecting Paso Robles with Interstate 5. Commercial airports are located in Paso Robles and San Luis Obispo further south. Amtrak services Salinas and San Luis Obispo.

Each installation of the Fort Ord complex supports an interior network of roads, many of which are available for public use. Fort Ord provides access roads for recreational activities such as hunting and fishing as well as to the Laguna Seca Road Race Course. Several interior roads of Fort Hunter Liggett, including the Nacimiento-Fergusson and Milpitas Roads, travel through the installation to Highway 1 on the coast and the Los Padres National Forest to the north. Access is also available within military property for recreational activities and tourism of the San Antonio Mission and other historical or archeological sites. The interior roads of Camp Roberts also provide access for limited public recreational activities within military property.

Fort Ord

Military Land Use

Fort Ord is located in the Monterey Bay area approximately 118 miles south of San Francisco. The post covers an area of 28,038 acres. Fort Ord's military mission provides for the activation and training of the 7th Infantry Division and its components. A total of 16,000 acres (57 percent of the installation) comprising 19 training areas with 23 specific training sites are available for field exercises, maneuvers, firing ranges, and impact areas (see Figure 5). A total

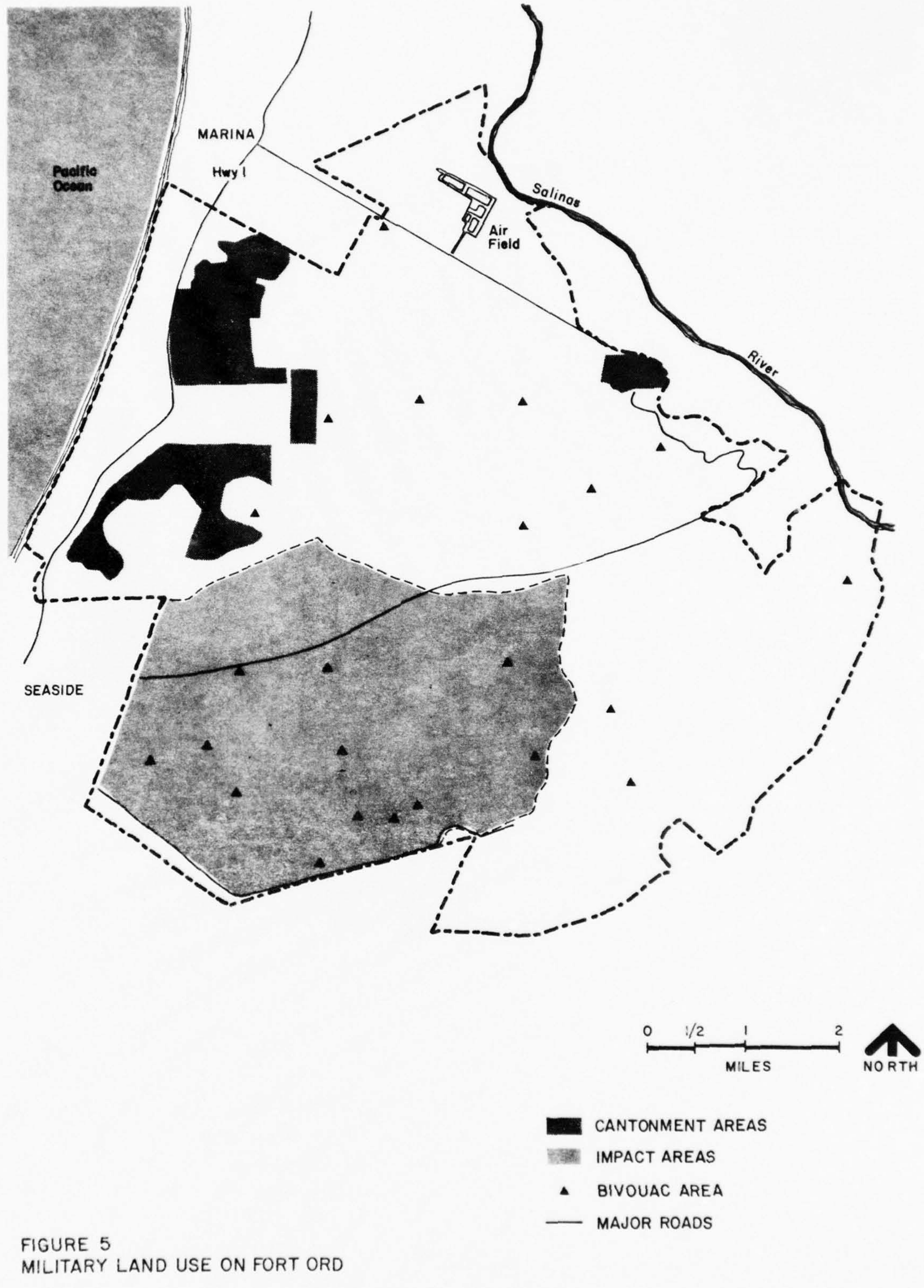


FIGURE 5
MILITARY LAND USE ON FORT ORD

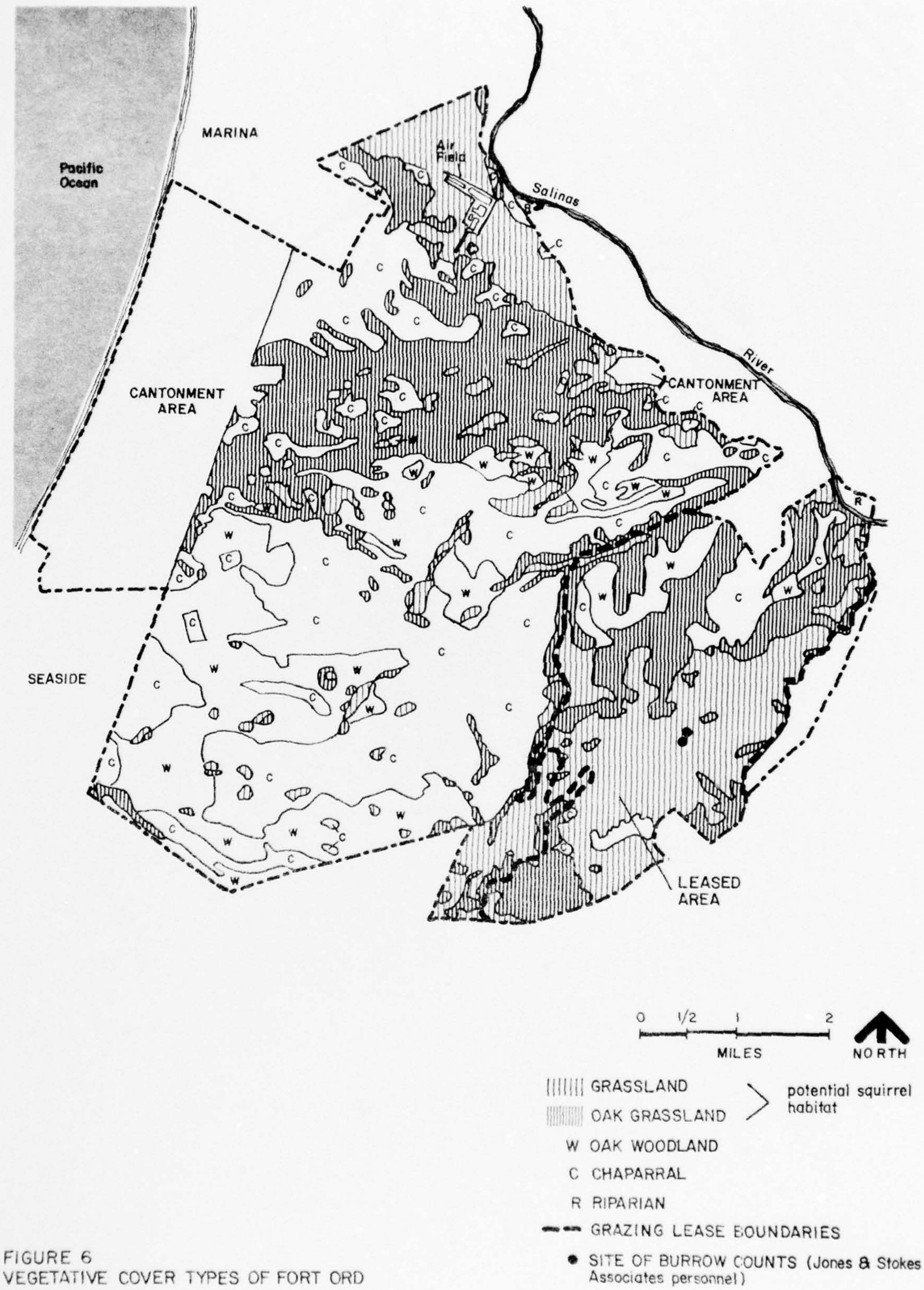


FIGURE 6
VEGETATIVE COVER TYPES OF FORT ORD

of 4,191 acres (15 percent of the installation) are used by the Main Post including permanent facilities such as the Regimental and Brigade Headquarters and five major family housing areas. Approximately 1,524 acres or 5.4 percent of Fort Ord is occupied by the facilities and airstrip used by Fritzsche Army Airfield. The four miles of coastline fronted by the installation are used for the operation of firing ranges (Department of the Army, 1976).

The Natural Resources Conservation Program on Fort Ord involves the entire installation. Included in this program are the grazing outlease program and the fish and game program. The grazing outlease program was established to reduce the fire hazard during summer months. The one sheep lease under this program involves 6,031 acres to be grazed primarily during the months between February and June. Fort Ord also permits one apiary lease for 100 hives on two one-half acre plots to be used from March through September. The fish and wildlife program provides for such projects as habitat enhancement, fish stocking, and associated hunting, fishing and recreational activities. There were over 4,000 hunter and angler days of use on Fort Ord in 1975 (Department of the Army, 1975).

Adjacent Land Use

Land use adjacent to Fort Ord includes a variety of interests. The urban centers of Seaside and Marina are located to the southwest and northwest of the installation. Northeast of Fort Ord lies the Lower Salinas Valley. Here valuable row crops, such as lettuce, celery, cauliflower, broccoli and potatoes are grown. Limited acreage of dry and irrigated pastureland is also maintained along the northeastern border of the installation. Lands to the south and east are primarily private dwellings and open grazing range. The Toro Regional Park adjoins Fort Ord along its eastern border (Monterey County Planning Commission, 1972).

Archeological/Historical Resources

There are no known archeological or historical sites within the boundaries of Fort Ord. Archeological investigations at Fort Ord have been sporadic and have shed little light on aboriginal settlement patterns or subsistence. Fort Ord is located in what was once the territory of northern Costanoans (from Spanish Costanos, "coast people") who were linguistically affiliated with the Miwok and other Penutian speakers to the east and north (Kroeber, 1970). The Costanoans occupied a region along the coastline from San Francisco Bay to south of Monterey and inland to the Diablo Ranges.

Relatively little of their culture is known because of efforts by the Spanish to establish missions in the 1700s and the subsequent development of Monterey Bay as a major harbor. Today, the Costanoan group is virtually extinct.

Flora

Fort Ord, which lies in the Monterey Peninsula area, is represented by a diversity of vegetation (Figure 6), including several rare and endangered species (Table 5). A species list is found in Appendix A (California Native Plant Society, 1974; California Natural Areas Coordinating Council, 1975; and Department of the Army, 1976).

The coastal strand is characterized by dune grasses, native and exotic ice plants (*Mesembryanthemum* sp.) and various other beach plants. The coastal scrub, a stabilized dune community, lies eastward of the coastal strand. This community is characterized mainly by several unique species of manzanita (*Arctostaphylos* sp.).

Farther inland, oak woodland, grassland and chaparral communities are common. The northwestern and eastern portions of the reservation are dominated by open grasslands and grass interspersed, open stands of oak woodland. Foxtail grasses (*Hordeum* sp.), brome (*Bromus* sp.), wild oats (*Avena* sp.) and annual rye grasses (*Lolium* sp.) as well as several forb species such as bur clover (*Medicago polymorpha*) and filaree (*Erodium* sp.) are common. The coastal live oak (*Quercus agrifolia*) is the predominant tree. Bracken ferns (*Pteridium aquilnum*) and poison oak (*Rhus diversiloba*) are often found in the oak woodland understory.

The remaining major portions of the reservation are dominated by chaparral communities comprised mainly of several species of manzanita and ceanothus (*Ceanothus* sp). A limited amount of marshland and riparian habitat with their associated plant species occurs within the reservation.

To protect the rare or endangered plant species and unique plant communities, nine native plant preserves have been established in conjunction with the California Native Plant Society of the University of California, Davis. Plants represented in the preserves include: sand-mat manzanita (*Arctostaphylos pumila*), toro manzanita (*A. montereyensis*), Monterey ceanothus (*Ceanothus rigidus*), Eastwood's ericamerica (*Haplopappus eastwoodiae*), coast wallflower (*Erysimum ammophilum*), slender flowered gilia (*Gilia tenuiflora* ssp. *arenaria*) and coast silktassel (*Garrya elliptica*).

Table 5

VERY RARE AND RARE AND ENDANGERED PLANTS FOUND IN THE STUDY AREAS

Common Name	Scientific Name	Rarity Code* R	E	V	D	Habitat and Plant Community	Study Area Location
Coast wallflower	Erysimum ammophilum	1	2	1	3	Dunes, coastal strand	Fort Ord
Ben Lomond wallflower	Erysimum teretifolium	3	2	2	3	Dunes, coastal strand	Fort Ord
Eastwood's ericamerica	Happlopappus eastwoodae	3	3	3	3	Dunes, coastal strand coastal scrub	Fort Ord
Toro manzanita	Arctostaphylos montereyensis	2	1	1	3	Sand hills and woods, coastal scrub	Fort Ord
Sand-mat manzanita	Arctostaphylos pumila	2	2	2	3	Sand hills and woods, coastal scrub	Fort Ord
Seaside bird's beak	Cordylanthus littoralis	3	2	1	3	Back of coastal strand	Fort Ord
Monterey ceanothus	Ceanothus rigidus	2	2	1	3	Sand hills and flats, coastal scrub	Fort Ord
Purple amole	Chlorogalum purpureum var. purpureum	3	3	1	3	Plains at 1,000 feet, foothills	Jolon; Fort Hunter-Liggett
One-awned spine flower	Chorizanthe rectispina	2	2	1	3	Dry slopes, chaparral	Fort Hunter-Liggett
Carmel Valley bush-mallow	Malacothamnus palmeri var. involucratus	2	2	1	3	Foothills, dry rocky slopes, chaparral	Fort Hunter-Liggett
Indian Valley chorizanthe	Chorizanthe insignis	2	2	1	3	Foothills, sandy places, chaparral	Fort Hunter-Liggett
Santa Lucia pogogyne	Pogogyne clareana	3	2	1	3	Foothills, chaparral	Fort Hunter-Liggett
Hickman sidalcea	Sidalcea hickmanii ssp. hickmani	2	1	1	3	Dry ridges, chaparral	Fort Hunter-Liggett
Hardham bedstraw	Galium hardhamae	2	1	1	3	Rocky dry places, pine forests	Fort Hunter-Liggett

* RARITY - ENDANGERMENT CODES

The California Native Plant Society's (1974) Rarity Endangerment Code consists of a series of four numbers used to rate the status of rare or endangered plants. The codes are a series of four digits. The first digit represents rarity; the second, endangerment; the third, vigor; and the fourth, general distribution.

Rarity (R) (..."amount of the plant both in terms of numbers and also in terms of manner and extent of distribution.")
1. Rare, of limited distribution, but distributed widely enough that potential for extinction or extirpation is apparently low at present.
2. Occurrence confined to several populations or one extended population.
3. Occurs in such small numbers that it is seldom reported; or occurs in one or very few highly restricted populations.

PE Possibly extinct or extirpated.

Endangerment (E) (..."embodies the concept of a plant being threatened with extinction or extirpation.")
1. Not endangered.
2. Endangered in part.
3. Totally endangered.

Vigor (V) (..."dynamics of the plant in terms of numbers of individuals or populations.")
1. Stable or increasing.
2. Declining.
3. Approaching extinction or extirpation.

General Distribution (D)
1. Not rare outside California.
2. Rare outside California.
3. Endemic to California.

Sources: California Native Plant Society, 1974; Munz, 1959 and 1968; Department of the Army, 1975.

Many exotic grasses, forbs, shrubs and trees are also found on Fort Ord. Several introduced trees such as eucalyptus and several species of pines have been planted in some developed areas.

Fauna

The diverse habitat of Fort Ord supports a large number of fish and wildlife species. Over 200 species of vertebrates have been identified, including 23 species of reptiles and amphibians; six freshwater and anadromous species of native and introduced fishes, as well as numerous salt water species; 149 species of birds either residential or migratorial; and 35 species of marine or terrestrial mammals (Department of the Army, 1975). See Appendix B species list.

An active fish and game management program exists on Fort Ord. Some species important to recreational activities are the California valley quail (*Lophortyx californicus*), mourning dove (*Zenaida macroura*), jack and brush rabbits, deer, rainbow trout (*Salmo gairdneri*) and largemouth bass (*Micropterus salmoides*).

Many nongame species also inhabit the reservation lands. Included are 13 species of raptors (hawks, eagles, owls, falcons), a wide variety of marine and passerine bird species, and numerous small and large mammal species including the coyote (*Canis latrans*), badger (*Taxidea taxus*) and striped skunk (*Mephitis mephitis*).

Two rare or endangered birds have been observed on Fort Ord property: the southern bald eagle (*Haliaeetus leucocephalus leucocephalus*), and the California least tern (*Sterna albifrons browni*) (Department of the Army, 1976). Four protected reptile species may occur in the area. They are the coast horned lizard (*Phrynosoma coronatum frontale*), California legless lizard (*Anniella pulchra*), San Joaquin whipsnake (*Masticophis flagellum roddocki*) and the California mountain kingsnake (*Lampropeltis zonata multifasciata*) (Department of the Army, 1975). One endangered species of butterfly, Smith's blue (*Shijimiaeoides enoptes smithi*), occurs on the coastal sand dunes of Fort Ord. Their numbers on base property have been reduced as the result of heavy foot and vehicular traffic, as well as the spread of introduced ice plant (U. S. Fish and Wildlife Service, 1976). In addition, the rare and endangered Santa Cruz long-toed salamander (*Ambystoma macrodactylum* var. *eroceum*) may inhabit moist zones of Fort Ord (Department of Fish and Game, 1976).

Soils

The predominant soils found on Fort Ord Reservation are associated with the Arnold, Santa Ynez and the Baywood soil series and the dissected Xerorthents found along the Salinas River. The Arnold and Santa Ynez soils series are moderately to excessively drained with slopes of 9 to 30 percent. Runoff is medium to rapid and erosion hazard is moderate to high. These soils are suited for seeding to adapted grasses and legumes and are typically covered with annual grasses, forbs, oaks, eucalyptus, manzanita, and chamise.

Cantonment and military maneuver areas are situated on Baywood soils series. This soil is primarily found on stabilized aeolian sand dunes. Included within the Baywood soil mapping areas were mixtures of Oceano soils and Duneland.

Soils along the Salinas River are representative of the Mocho series. These are well drained soils formed on flood plains, alluvial fans, terraces, and river benches in mixed alluvium. Soil textures vary from fine sandy loam, loam, silt loam, to silty clay loam. They are suited for dryland grain, hay, and pasture.

The steep bluffs along the Salinas River consist of dissected Xerorthents soils which require good range management as well as protection from overgrazing. The banks along rivers and streams are typically moderately to severely eroded in areas where these soils are present (Soil Survey of Monterey County, California, Department of Agriculture, Soil Conservation Service, 1975).

Fort Hunter Liggett

Military Land Use

Fort Hunter Liggett is located in southwestern Monterey County approximately 60 miles south of Fort Ord. The total acreage of the reservation is 166,535 acres. The Fort's primary mission is to support the U. S. Army's Combat Development Experimental Command (CDED) field experimentation, and the training and maneuvers of the 7th Infantry Division both headquartered at Fort Ord. Approximately 165,000 acres are used for infantry, armor, artillery and aircraft experiments (bivouacs, 790 acres; impact area, 27,500 acres; magazine and other training areas, 136,723 acres) (see Figure 7). The headquarters and cantonment facilities occupy 140 acres of the installation (Department of the Army, 1976).

Under Fort Hunter Liggett's Natural Resources Program, certain areas of the installation totalling approximately 106,390 acres are under four cattle grazing leases. The Fort also provides for a fish and wildlife program involving such projects as pond improvements, fish stocking, game and nongame surveys, research, and hunting and fishing access. In 1973 there were over 12,000 hunter days and over 3,900 angler days of use on the installation. In addition, a forestry program providing for tree planting and firebreak maintenance and environmental programs are underway on the installation (Department of the Army, 1973).

Adjacent Land Use

The Los Padres National Forest is adjacent to Fort Hunter Liggett along the majority of its western and northern borders. Monterey County Flood Control District land adjoins the installation at the southeastern corner adjacent to the San Antonio Reservoir. All other land to the east and south is private field cropland, mainly grain crops such as barley and wheat and dry or irrigated pastureland (Monterey County Planning Commission, 1972).

Archeological/Historical Resources

The Salinan Indians were the first inhabitants of the Hunter Liggett area. Their range extended from the ocean on the west to the Salinas Valley on the east with the center of tribal territory located along the Nacimiento and San Antonio Rivers.

Edwards (1973), as reported in Fort Ord Mission Change (1976), investigated 77 archeological sites within a sample area in and near Hunter Liggett. He estimates that at least 400 to 600 archeological/historical sites exist (or did exist) within the area. The Maria Jose Gil Adobe, Dutton Hotel and the Painted Cave are currently listed in the National Historical Register. The San Antonio de Padua (mission) was listed on the National Historic Register, April 26, 1976. It is also listed as a California Landmark. Other sites on the post being considered for the National Historical Register are Tidball or Jolon Store, Upper Stoney Valley Indian Occupational Site, San Miguelito Ranch House Ruins Indian Occupational Site, and 4-MNT-349 Indian Occupational Site.

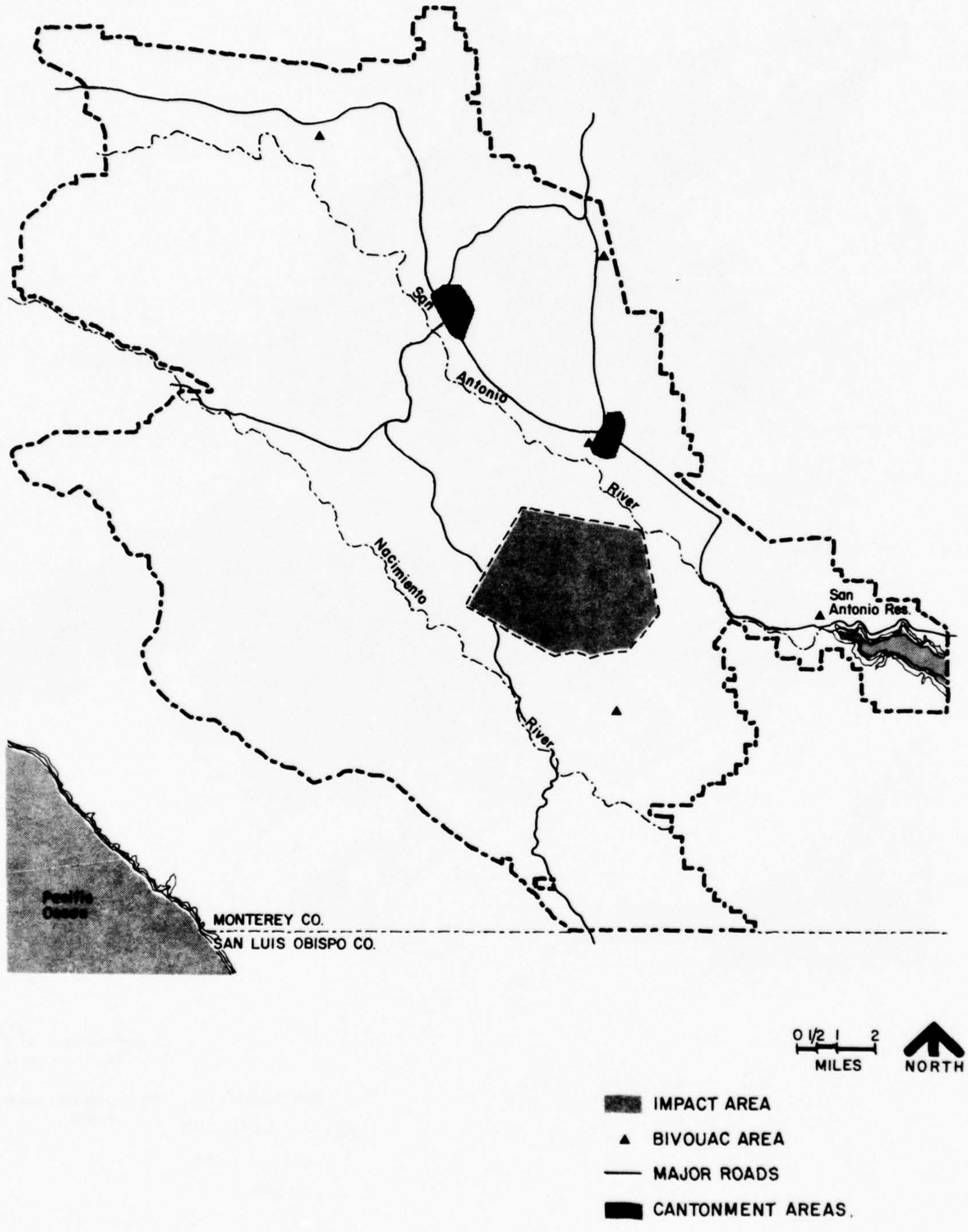
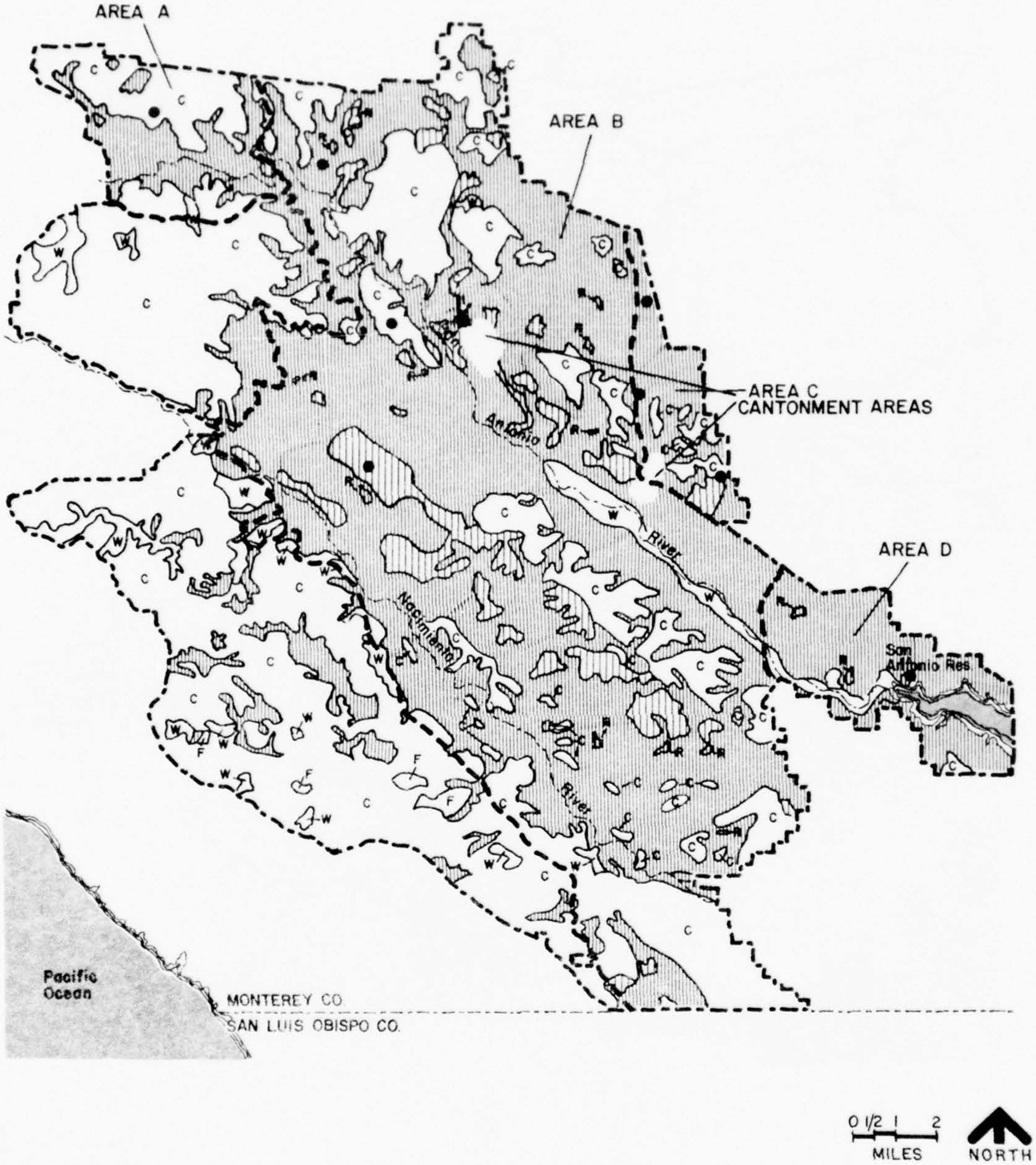


FIGURE 7
MILITARY LAND USE ON FORT HUNTER LIGGETT



GRASSLAND
OAK GRASSLAND
} potential squirrel habitat

W OAK WOODLAND

C CHAPARRAL

R RIPARIAN (includes reservoirs)

F CONIFEROUS FOREST

GRAZING LEASE BOUNDARIES

● SITE OF BURROW COUNTS (Jones & Stokes Associates personnel)

FIGURE 8
VEGETATIVE COVER TYPES OF FORT HUNTER LIGGETT

Flora

Four general vegetation types occur on Fort Hunter Liggett. These are the valley white oak grassland, the blue oak grassland, mixed chaparral and chamise chaparral (Department of the Army, 1973) (Figure 8). See Appendix A for species list.

The valley white oak grassland is dominated by large California white oaks (*Quercus lobata*) and many annual grasses and forbs, such as bromes, wild oats, bur clover and filaree. This vegetation type, composed mostly of non-native forbs and grasses, is generally found on the more moist, level or gently-sloping topography and covers approximately 25 percent of the reservation.

The blue oak woodland grass community occurs on less moist, sloping to steep topography, covering approximately 40 percent of the reservation. The density of oaks is greater in this vegetative type than in the valley white oak community. The dominant tree is the blue oak (*Quercus douglasii*). Grasses, such as wild oats, bromes, fescues and wild barleys (*Hordeum* sp.) also occur here.

Mixed chaparral covers approximately 30 percent of the reservation, occurring on moderate to very steep, north- and east-facing slopes. Principal shrub species are scrub oak (*Quercus dumosa*), chamise (*Adenastoma fasciculatum*), toyon (*Heteromeles arbutifolia*) and many species of manzanita and ceanothus.

The remaining 5 percent of the reservation is characterized by dense chamise chaparral, which is dominated by the one shrub species. This vegetation type generally occurs on the hotter, drier, south- and west-facing slopes.

One unique botanical area exists on Fort Hunter Liggett in the vicinity of Jolon. A rare, endemic species (*Chlorogalum purpureum* vs. *purpureum*), the purple amole, purple snaproot or soap plant is found here. Six additional rare and endangered plant species occur on installation property (Table 5).

Fauna

Hunter Liggett Military Reservation also supports a wide variety of wildlife with many of the same nongame and game species as Fort Ord. See Appendix B for partial species list. Two fully protected species are known to occur on Hunter Liggett Military Reservation. These are the ring-tailed cat (Bassariscus astutus) and golden eagle (Aquila chrysaetos) (Department of the Army, 1976). Four rare and endangered species, the California condor (Gymnogyps californianus), southern bald eagle (Haliaeetus leucocephalus), American peregrine falcon (Falco peregrinus) and San Joaquin kit fox (Vulpes macrotis mutica), have been observed on the reservation.

Reservoirs on the installation support several game species. The San Antonio Reservoir, lying along the southeastern border, is a warmwater body providing habitat for game fish such as smallmouth bass (Micropterus dolomieui) and sunfish, including bluegill (Lepomis macrochirus) and green sunfish (Lepomis cyanellus). Nongame fish present include the Sacramento squawfish (Ptychocheilus grandis) (Snider, pers. comm.).

A fish and game management program is also maintained at Hunter Liggett Military Reservation. Several species important to recreational activities include deer, wild pigs (Sus scrofa), mourning dove, California valley and mountain quail (Oreortyx pictus), rabbit, black bass, sunfish and rainbow trout.

Several reptiles and amphibians can be found on the installation. The California newt (Taricha torosa) and the California toad (Bufo boreas halophilus) are common amphibians in moist areas of the reservation. The numerous reservoirs on the installation also support the western pond turtle (Clemmys marmorata). In drier areas, the common western fence lizard (Sceloporus occidentalis) and western rattlesnakes (Crotalus viridis) can be found. See Appendix B for partial list.

Soils

Soils on Hunter Liggett include Santa Lucia, Reliz, Chamise, Gazos, Nacimiento, Chualar, San Benito, Los Osos soil series and rock outcrops. The Santa Lucia and Reliz soils consist of well drained to excessively drained soils formed on uplands, underlain by shale and sandstone with slopes from 30 to 75 percent. Runoff is rapid to very rapid and erosion hazard is very high. Vegetation consists of annual grasses, forbs, scrub oaks, coastal oaks, chamise,

and manzanita. These soils generally occur together and are used for limited range, wildlife and watershed. When producing at potential the total herbage production is available for livestock and wildlife. These soils require good range management practices including protection from overgrazing.

Rock outcrops consist of strongly sloping to extremely steep mountainous uplands with rock outcrops and very shallow soils. This is typical of the area east of the Coast Ridge Road, west of the Nacimiento River and between Burma and McKern Roads on Hunter Liggett. Vegetation consists of sparse annual grasses and forbs, brush hardwoods, and pines. Runoff is very rapid and the erosion hazard is very high where soil is exposed. Rock outcrop value is mostly for watershed, wildlife habitat, recreation and scenic value.

The steep Nacimiento and Los Osos series consist of well drained soils formed on mountainous uplands with slopes from 9 to 75 percent. Runoff is medium and erosion is moderate. Vegetation is similar to Santa Lucia and Reliz soils. These soils are primarily used for range and in some areas dryland grain.

Along some of the valleys on Hunter Liggett are Chualar soils underlain by shale, sandstone, granite or schists. Also in the same area are inclusions of brown sandy loam soils that occupy low knolls and are 10 to 14 inches deep to bedrock. This soil is used for irrigated row crops and field crops and dryland grain. Some areas are used as ranges for grazing (Soil Survey of Monterey County, California, Department of Agriculture, SCS, 1975).

Camp Roberts

Camp Roberts is located 5 miles south of the southern border of Fort Hunter Liggett. The camp, covering an area of approximately 43,745 acres, lies within both Monterey and San Luis Obispo counties. Camp Roberts is currently licensed to the California National Guard and is used primarily for National Guard and Reserve Component training. The 7th Infantry Division also uses the camp for training and maneuvers. Approximately 41,300 acres are available for infantry, artillery, and aircraft training exercises. Post facilities occupy approximately 1,400 acres (Department of the Army, 1976) (Figure 9).

Certain areas of Camp Roberts are also under livestock grazing leases. There are two sheep and one cattle lease with the primary grazing season for sheep from January to June. The cattle lease is for 5,854 acres and the sheep leases total 31,237 acres. Limited hunting and fishing access is permitted on Camp Roberts during regular seasons (Department of the Army, 1976).

Adjacent Land Use

The San Antonio River runs along the northwestern border of Camp Roberts with the land being controlled by the Monterey County Flood Control District (Monterey County Planning Commission, 1972). The City of Bradley is situated on the northern border of the installation. Private land on the northwestern and western borders is primarily dry pastureland. East of Camp Roberts, land is utilized for crops (including wheat, barley and safflower and for dry pastureland (San Luis Obispo County Department of Agriculture, 1976). To the south and southeast lies unused private land much of which is dominated by heavy tree and brush cover (San Luis Obispo County Planning Department, 1969.

Archeological/Historical Resources

There are to date no known archeological studies or known archeological sites on Camp Roberts. Archeologists have not evidenced any interest in making investigations of the area (Fort Ord Mission Change Draft EIS, 1976).

Flora

The species composition of Camp Roberts is similar to that of Fort Hunter Liggett. The dominant vegetation types are grassland, valley oak grassland, which includes riparian habitat characterized by cottonwood (*Populus* sp.), willow (*Salix* sp.), sycamore (*Platanus racemosa*), and box elder (*Acer rugundo*); and the blue oak grassland found in more sloping topography. Throughout these vegetation types, most of the forbs and grasses are exotic species introduced by the early missionaries. A limited amount of mixed chaparral habitat occurs on drier, more elevated slopes (Figure 10).

No rare or endangered plant species have been reported for Camp Roberts. See Appendix A for species list.

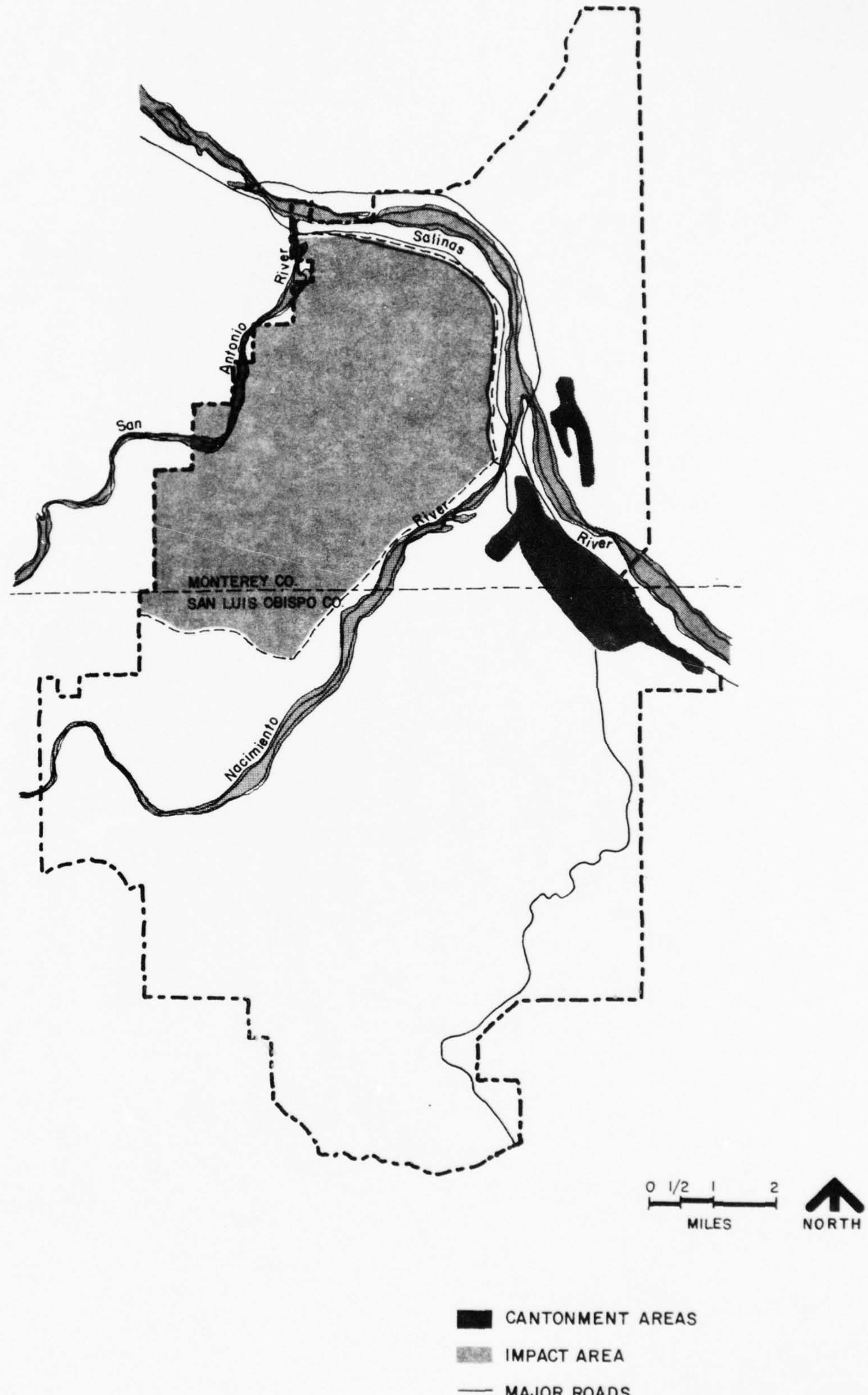


FIGURE 9
MILITARY LAND USE ON CAMP ROBERTS

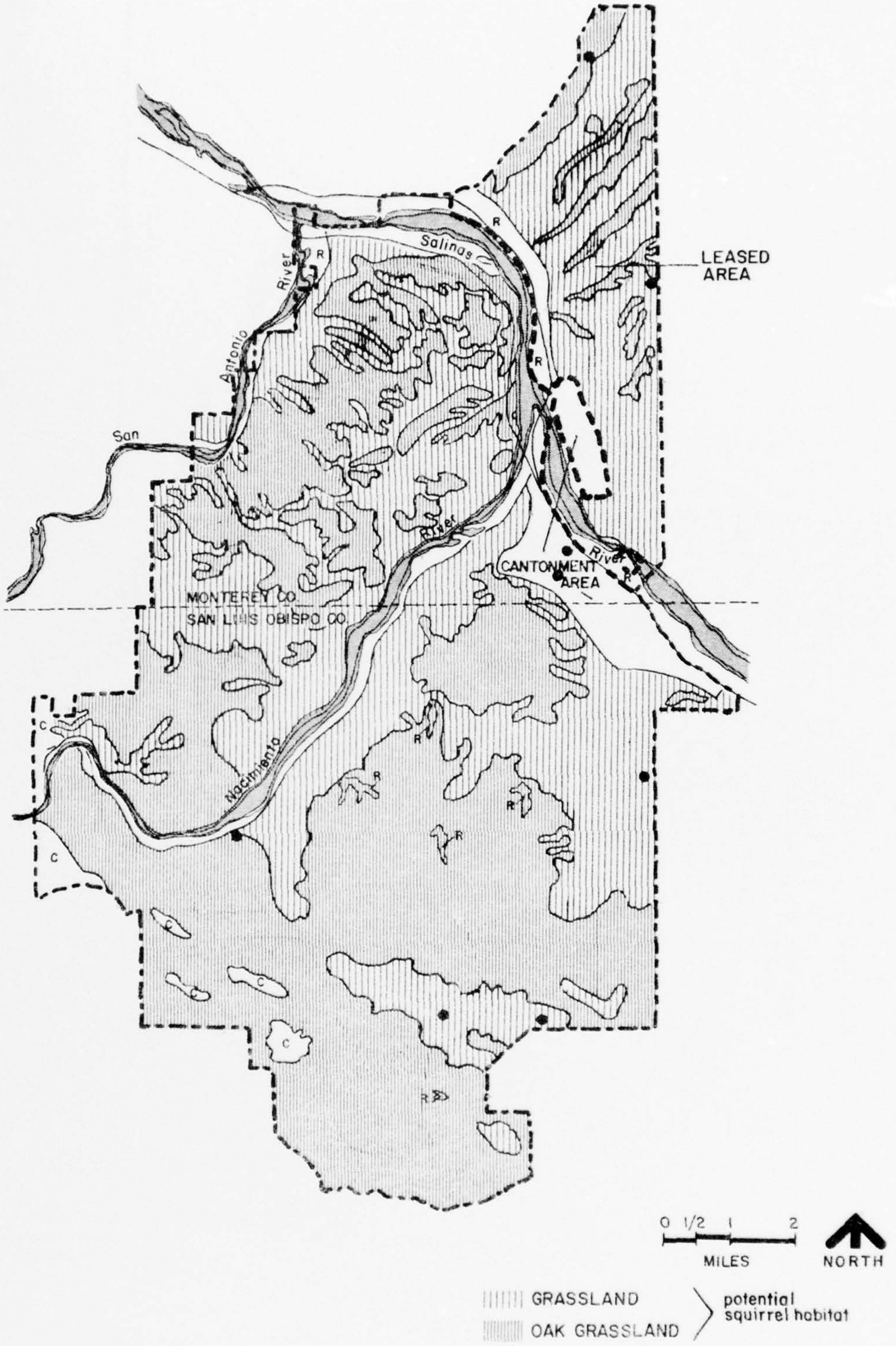


FIGURE 10
VEGETATIVE COVER TYPES OF CAMP ROBERTS
(Source: Fairchild Aerial Survey Map (1964) & US Dept. of the Army Aerial Photos (1963))

Fauna

Camp Roberts, with vegetative species composition similar to Hunter Liggett Military Reservation, also supports a similar diversity of nongame and game species of wildlife. See Appendix B for species list. A single den site of the rare and endangered San Joaquin kit fox has been located on the reservation. The rare and endangered peregrine falcon and southern bald eagle have also been observed on Camp Roberts.

The Salinas, San Antonio and Nacimiento Rivers crossing military property support rainbow trout, green sunfish and Sacramento suckers (*Catostomus occidentalis*) as well as other game and nongame fishes (California Department of Fish and Game, 1955) (see Appendix B for species list).

A limited amount of hunting and fishing is permitted on Camp Roberts during regular seasons. A cooperative catchable rainbow trout program with California Department of Fish and Game provides sport fishing to the public along the lower Nacimiento River within military property (Johnson, 1965).

The distribution of several reptiles and amphibians may include Camp Roberts. Among these are the California newt, bull frog (*Rana catesbeiana*), the California alligator lizard (*Gerrhonotus multicarinatus*) and the Pacific gopher snake (*Pituophis melanoleucus*) (Appendix B).

Soils

The predominant soil series in upland areas of Camp Roberts are similar to those at Hunter Liggett. In areas of lower elevations Nacimiento, Arroyo Seco, Chualar, Garey, Gaviota, Los Osos, Placentia, Plaskett, and Santa Lucia series soils are present.

Cantonment areas of Camp Roberts are situated on well-drained Garey sand loam and Chualar loam soils. Garey soils are formed on gently sloping (5 percent) dune-like terraces. Runoff is medium and erosion hazard is moderate. They are mostly used for annual pasture.

Chualar soils are formed on fans and terraces. Slopes are 0 to 9 percent. They are used mostly for irrigated row crops and field crops.

Psamments and fluvents soils are subject to occasional flooding. These soils are found along the banks of the Arroyo Seco, perennial and intermittent streams, and San Antonio, Nacimiento, and Salinas Rivers. Drainage is excessive and permeability is rapid. These soils have very little agricultural value. They are used for recreation and some grazing.

Other areas on Camp Roberts consist of smaller isolated areas of different soil series and larger areas previously described. (The soils of San Luis Obispo County are in the process of being mapped. For the present study the soils of Camp Roberts which lie within San Luis Obispo County will represent an extrapolation of data based on regional geology, topography and vegetation from Monterey County.)

Ground Squirrels

Life History - General

Distribution of the beechey ground squirrel (*Spermophilus beecheyi*) is limited primarily to the State of California, with the subspecies (*Spermophilus beecheyi beecheyi*) extending along the coast from the Golden Gate and Carquinez Strait south nearly to San Diego. The closely related subspecies (*Spermophilus beecheyi fisheri*) is most abundant on the plains of the San Joaquin and lower Sierra foothills. The ground squirrel's preferences of habitat are not closely constrained in the valleys, except that it avoids wetlands, dense chaparral and thick woods. It frequently inhabits grain fields, grazing lands, meadows, orchards, rock outcrops on the top of ridges, sparsely tree-covered slopes and granite talus slopes (Grinnell and Dixon, 1918). They also inhabit road banks, dams, airports, picnic areas and other areas disturbed by man.

Ground squirrels naturally feed on most plants, fruit, seeds, bird eggs and some animal matter. Vegetation becomes available to squirrels with the start of fall rains; broadleaf filaree, brome and fescue grasses are the staples of diet. During the early stages of growth, entire plants are taken. Later in the season as the plants mature, the tender leaves and fruits are selected. Large quantities of immature fruits are consumed during the spring, and after the seeds ripen these comprise most of the food (Horn and Fitch, 1942).

All ground squirrels are diurnal. During spring and summer they come out of their burrows soon after sun-up. During those seasons, ground squirrels are most active during the middle of the morning and again during the late afternoon, avoiding the intense heat of midday. During midwinter those

squirrels which do not hibernate and remain underground altogether, appear only late in the forenoon of bright sunny days (Grinnel and Dixon, 1918).

The most conspicuous signs of ground squirrel activity are their burrow systems and runways. Observations by Storer (1942) and confirmed by Jones & Stokes Associates, Inc. (1976) personnel during field studies, indicate that burrows average about 4 inches in diameter. Large mounds of soil are excavated from the burrows during the spring. This soil is commonly dispersed in a fan-shaped pile in front of, and to the sides of the burrow entrance (Figure 11). An average area of 2.0 square feet of displaced soil was found to cover the vegetation around burrow openings on Hunter Liggett and Camp Roberts (Jones & Stokes Associates, Inc., field observations, 1976). Burrows are used for hibernation, safety retreats and shelter during very hot or rainy weather, storage of food, and for rearing young. Horn and Fitch (1942) state that the burrowing habit of ground squirrels has a two-fold effect. Through the action of burrow construction, displaced soil is brought to the surface which results in a certain amount of ground area kept bare of vegetation. At the same time the nutrient rich soil resulting from the decomposition of dead squirrels and other animals that have died, in burrows, feces, hulls and other plant material are brought to the surface and mixed in the soil thus increasing the long-term productivity.

Runways are formed on the soil surface between areas frequented by ground squirrels. Linsdale (1946) states that runways are essential for rapid progress by animals which travel close to the ground and are not especially fitted to leap over obstacles. He further states that a fairly heavy population of squirrels seems to be required for the formation of runways. Runways usually appear between the burrows and extend out to foraging sites. The width of runways varies, but is rarely greater than 6 inches (Linsdale, 1946) (Figure 12).

Ground squirrels produce one litter a year. Litter sizes vary according to location and population density. The average litter size is 7 to 8, and ranges from 1 to 15. The gestation period is 25 to 30 days and the young generally remain underground about 6 weeks. As young squirrels mature some of them move away from the area of the parental burrows into new territory, but usually occupy old burrows.

> The rate of reproduction in ground squirrels is such that unless 90 percent are eliminated in a given year there will be no general reduction in numbers. Theoretically, it would require 8 to 9 years of control at this rate to rid a given piece of land of squirrels entirely. (Storer and Jameson, 1965)

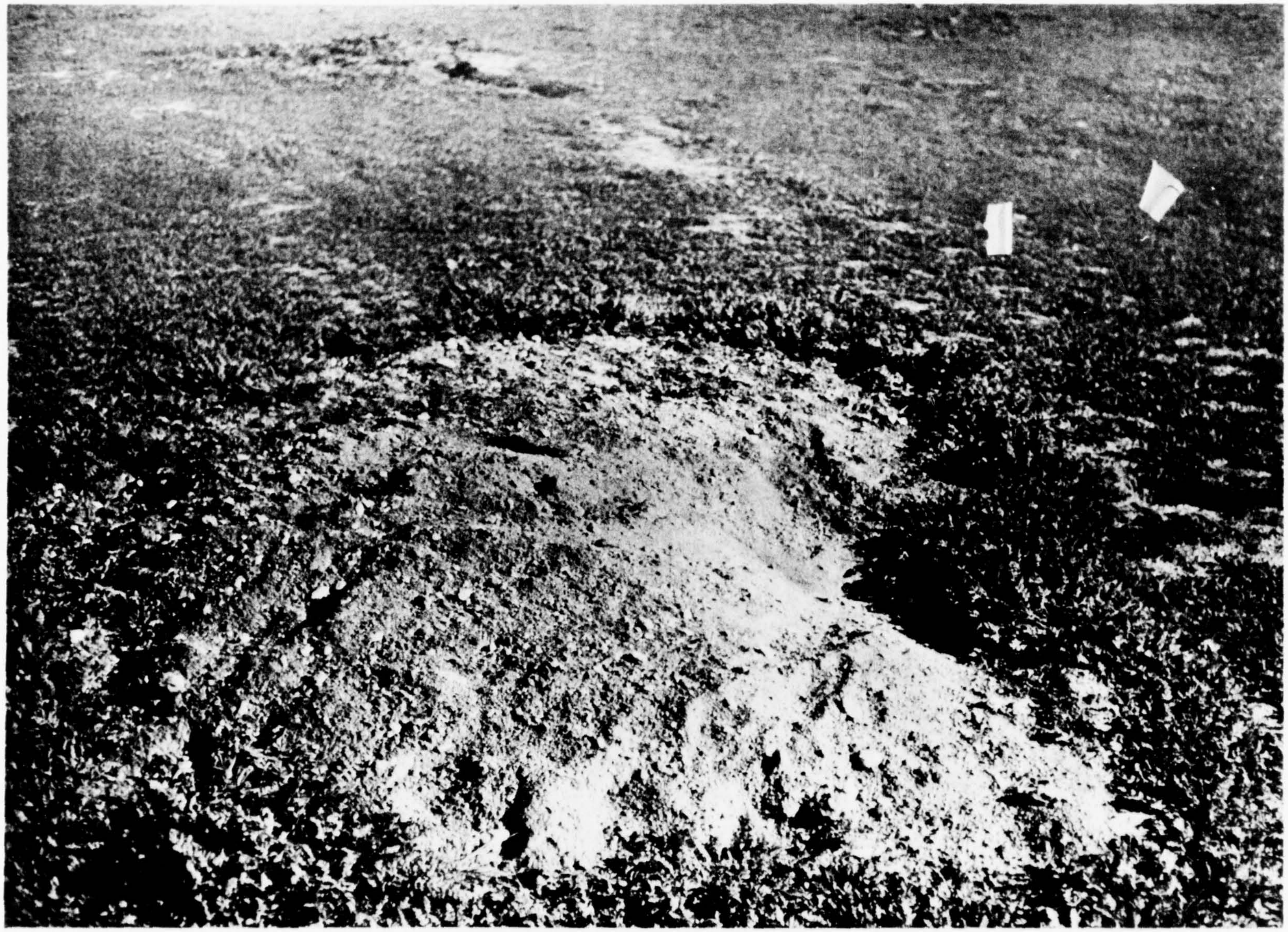


Figure 11. Soil Displacement Resulting From Burrow Excavations at Camp Roberts

Figure 12. A Runway Made by Ground Squirrels at Camp Roberts

Neither the proposed nor alternate action discussed in the report are intended to eliminate or eradicate the ground squirrels, but rather to suppress their populations. The statement of Storer and Jameson (1965) does, however, point out that to effectively reduce the overall population from one year to the next a high degree of control (approximately 90 percent) must be achieved. Rapid population recovery following the control of many rodent species has been well documented in the literature.

These facts show that persistent and intensive efforts are needed to keep the squirrel populations at levels necessary to minimize conflicts.

Ground squirrels may live 5 years or more in the wild. Outbreaks of epizootic sylvatic plague and other diseases periodically reduce ground squirrel numbers in some areas. Among the natural enemies which prey on ground squirrels are coyotes, badgers, weasels, bobcats, red-tailed hawks, golden eagles, rattlesnakes and gopher snakes. A list of these species as well as others that frequent similar habitat can be found in Appendix B. Other factors undoubtedly contribute to the mortality of ground squirrels, but they are difficult to appraise.

California ground squirrels living at high altitudes and most of the population at lower elevations (especially the adults), hiberate for a part of each year. Before this period of inactivity, each animal accumulates excess body fat. After going below ground the squirrel plugs up to 3 feet of tunnel near the nest with earth and curls up in its nest behind the tunnel plug. While the squirrel hibernates, the rate of heart-beat and respiration is greatly reduced, and body temperature drops nearly to that of ambient air temperature in the burrow.

Emergence from hibernation occurs in late winter or early spring. Immediately following hibernation, males are usually more active than females, though activity tends to become more equalized as the breeding season approaches (Fitch, 1948). Breeding takes place mainly during early spring, and young are born in April and May with nearly all emerged from their burrows by mid-June (Holdenried, et.al., 1951). Field observations indicate that males and females older than one year of age begin breeding in early spring and terminate in late spring while the younger animals breed from early spring to early summer, thus extending the overall season from early spring to early summer (Dana, 1967).

A common habit of ground squirrels is aestivation ("summer sleep") during the warm months of the year. In California, beechey ground squirrel aestivation has been observed to begin as early as mid-May in the hills of east Livermore, and by late June

in the hills of eastern Kern County. Aestivation does not commence until early August in Siskiyou County for the closely-related Douglas ground squirrel (Spermophilus beecheyi douglasi). In areas of low elevation aestivation may extend up to true hibernation. In mild climates the young-of-the-year may not aestivate or hibernate, and may be seen above ground during suitable weather throughout the winter (California Department of Food and Agriculture, 1975).

Populations

Numerous ground squirrel population studies have been conducted in California in the past (Evans and Holdenried, 1943; Linsdale, 1946; Fitch, 1948; Fitch and Bentley, 1949; and Tomich, 1962). The highest populations of ground squirrels are associated with areas of open grasslands scattered with rock outcropping, trees or other surface features which serve to provide protection of burrows (Dixon, 1918; Fitch, 1948). Squirrel colonies and populations are rarely distributed evenly over the landscape, but rather are concentrated in areas where food supply and shelter are available and soil conditions are correct (Fitch, 1948). Ground squirrels are rarely seen living in areas of heavy tree and brush growth or on ungrazed land where dense stands of grasses are present (Evans and Holdenried, 1943).

Because ground squirrels occur in colonies with a number of animals living close together rather than being uniformly distributed in any habitat, population estimates of squirrels or burrows per square acre are oftentimes deceiving. According to Fitch (1948), the number of squirrels per colony often varies significantly from one year to the next. Fitch and Horn (1942) found that on the San Joaquin Experimental Range ground squirrel colonies contained from 10 to 50 burrow holes with an average population of 2 to 3 squirrels per colony, but at times a maximum of 10 squirrels per colony.

Squirrel populations there varied from 3.2 squirrels per acre (43.6 burrows/acre) in 1940 to 2.0 squirrels/acre (40.8 burrows/acre) in 1946, while field observations during 1934 had indicated from 12 to 15 squirrels/acre on favorable sites. According to Marsh (pers. comm.), a concentration of greater than 50 burrows per acre is an indicator of a very dense ground squirrel population.

In addition to grasslands, ground squirrels are known to occur on sites disturbed by grazing and by human activities such as construction, grading, firebreaks, fills etc. (Balbach, 1976; Jones & Stokes Associates, Inc., field observations, 1976). Linsdale (1946) observed that ground squirrel populations on the Hastings Reservation tended to decrease after grazing was removed from the land, while Horn and Fitch (1942)

found no significant differences in squirrel population on areas lightly (2.7 squirrels/acre), moderately (2.3 squirrels/acre) or closely (4.1 squirrels/acre) grazed. There was, however, a significant difference on natural sites where grazing was completely excluded (0.8 squirrels/acre). Howard (1953) confirmed that regardless of whether grazing is light or close, alteration of plant species and density of forage cover by grazing of California annual plant type leads to an increase in the ground squirrel population.

Field Observations - November 8-19, 1976 by Jones & Stokes Associates, Inc.

General. Due to the season of the field investigation, mid-fall, squirrel densities were based primarily on the presence of burrows. Some squirrels were active above ground but there was no way to relate their numbers with existing total populations.

Squirrels were found to have strong habitat preferences related to vegetation, terrain exposure, soil types, man-made structures and land use. A combination of factors often contributed to the presence of preferred habitat. Some vegetative types support no significant squirrel populations.

The vegetative types supporting squirrels are grassland and oak-grassland, but many differences were found between habitats falling under these broad definitions. Squirrel burrows were nowhere evenly distributed over large areas, but tend to be in colonies and their distribution often relating to habitat factors other than vegetation.

Fort Ord. Squirrels were found in the grasslands and to a lesser extent in open oak-grassland. South-facing exposures were favored in the hilly grasslands with the possible exception of areas relatively near the ocean. Several colonies were found taking advantage of concrete slabs, junk piles and the airfield runways where their burrows would provide protection from digging predators. The face of a dirt fill dam in the grasslands was extensively burrowed. Squirrel colonies occur adjacent to the golf course fairways and in several parks within the main post.

Fort Hunter Liggett. Squirrel colonies were found throughout the grassland and oak grass areas. Chaparral and woodland types do not support significant populations.

In the grassland type there are some extensive (2 or more acres) colonies with fairly uniform burrow densities, but typically the colonies are based on some anomaly such as a lone tree, rocky outcrops, dry stream banks or mounds of earth pushed up by past military operations.

The oak-grassland areas are generally hilly and the squirrel colonies tend to be discrete. The favored locations are at the base of hills or on the upper slopes and tops. Northern exposures are the least used. Many burrows go under oak trees, especially when there are large valley oaks present. Steep, bare slopes along stream channels seem to be favored sites.

Squirrel colonies occupy artificial sites such as earth dam faces, roads and embankments and abandoned military structures.

Camp Roberts. Most of this post is either grassland or oak grass. There is a mixture of woodland, scrub and chaparral along the western boundary that is not squirrel habitat. In the East Garrison area the grassland and oak-grassland habitats do not contain as many squirrel colonies as at Hunter-Liggett. There are steep, wooded slopes with northern exposures that are hardly used. In the main camp area the woodland grass habitat is similar to that of Hunter Liggett and squirrel colony densities are about the same. In the interior of the main camp there are extensive flats and gently rolling hills that are treeless. Squirrel colonies here are numerous along road cuts and embankments, dry stream banks and abandoned military objects such as old tanks.

A number of squirrel colonies occur within the main base building area. A very dense colony was found in an athletic field and in a small park area. Squirrels frequently establish burrows beneath concrete slabs.

Burrow Counts. During November 1976, Jones & Stokes Associates, Inc. personnel conducted field investigations of Fort Ord, Hunter Liggett and Camp Roberts. The investigations were oriented toward obtaining data on the density and numbers of ground squirrel burrows. One-square-acre plots were marked off in representative habitats on Hunter Liggett reservation and at Camp Roberts. Several plots of less than one acre on earthen dam faces and in cantonment areas were also selected on the three installations (Figures 6, 8 and 10).

Ground squirrel burrows within the square-acre plots were marked with colored flags and counted. In addition, notes were made of habitat type, burrow opening size and area of dirt coverage per burrow. Colored slides and black and white photographs were taken of each site.

Ground squirrel burrows were generally found to be scattered in dense colonies throughout Hunter Liggett and Camp Roberts. The Fort Ord squirrel colonies were dense, but not as widespread as on the other two military reservations.

Based on general field observations and burrow counts, the squirrel populations at Hunter Liggett and Camp Roberts were judged to be the highest ever seen by the Jones & Stokes Associates, Inc. investigator (with 35 years of California field experience). Except for localized areas such as earthen dam faces, the Fort Ord populations, however, seem to be typical, medium high California densities.

Table 6 depicts the results of burrow counts on the three military areas. Because many squirrels had begun hibernation when these field studies were conducted, no accurate counts of squirrels per acre could be made. However, the number of burrows per acre does represent an indicator of relative abundance, assuming that 50 burrows/acre is considered to represent a "dense" ground squirrel population.

Very few previous estimates of ground squirrel populations have been made on any of the military reservations. On Camp Roberts, Sanger, et.al. (1974) estimated 16.7, 7.8 and 12.1 squirrels per acre on three study plots; however, no estimates were made of the number of burrows per squirrel.

Table 5A summarizes some observation of ground squirrel population changes since 1968.

Predators. A badger was observed excavating a squirrel burrow on Hunter Liggett. Red-tailed hawks and golden eagles were common at Hunter Liggett and Camp Roberts. One red-tailed hawk was seen with a freshly-killed squirrel. No coyotes or bobcats were seen or heard.

Ground Squirrel Damage

Ground squirrel populations, large or small, coupled with their foraging and burrowing habits, often conflict with man's use of the land. Through their burrowing action they damage man-made structures such as earthen dams, road surfaces and underground wiring, as well as landscaping and recreational facilities. Their foraging habits may damage croplands or rangeland, thereby resulting in competition with livestock or affect populations of other desirable wildlife (Figures 13, 14 and 15).

Army personnel have reported that ground squirrels have damaged many man-made structures on all three installations. The airstrip apron of Fort Ord has been continually undermined by ground squirrels and must be repaired periodically to prevent hazards to aircraft (Figure 16). Radar station mounds on Fort Ord have also been similarly damaged with the possibility that extensive undermining could cause tipping and malfunction of the radar tower (Figure 17). Ground squirrel burrowing, as observed by Jones & Stokes personnel, has resulted in widespread damage to earthen dams on Forts Ord and Hunter

Table 5A

INCREASE IN CALIFORNIA GROUND SQUIRREL POPULATION
AT FORT HUNTER LIGGETT, CALIFORNIA

Area	Distance Traveled (Miles)	Squirrel Count[1] 1968 Pre-Treatment[2]	Squirrel Count[1] 1968 Post-Treatment	Squirrel Count[1] 1976	Increase
Upper Stony	0.9	27	0	46	1.7X
Oak Flat	0.7	2	0	14	7.0X
Waller Creek	0.5	3	0	9	3.0X
Long Valley	1.0	4	0	52	13.0X

[1] Count from vehicle driven at 15 mph of squirrels visible on road and side of road provided by Mr. Gerald Griffey.

[2] Aerial application of 1080.

Table 6

RESULTS OF GROUND SQUIRREL BURROW COUNTS MADE BY
JONES & STOKES ASSOCIATES, INC. PERSONNEL, NOVEMBER 1976

Installation			Location			
Fort Ord	Hunter Liggett	Camp Roberts	Inhabited Areas	Open Areas	Habitat Type	Number of Burrows Per Acre
X				X	Earthen dam face	49* (.33 acre)
X				X	Grazed slope	72* (.15 acre)
	X			X	Grazed grassland, adjacent to creek	50
	X			X	Oak woodland	192
	X			X	Open grassland	51
	X			X	Del Venturi dam face	82* (.75 acre)
	X		X		Mowed grass, Hacienda	164
	X			X	Blue oak/grass slope	173
	X			X	Grassland/grain interface	155
	X			X	Grazed grassland/oak	82
		X	X		Tree/grass strip	92* (.83 acre)
		X	X		Baseball field	329
		X		X	Grassland/blue oak	111
		X		X	Grassland/grain interface	137
		X		X	Grassland/grain interface	111
		X		X	Grazed grassland/river cut bank	198
		X		X	Open grassland	7
		X		X	Grassland-oak/grain interface	80
		X		X	Road berm	30* (.02 acre)

* Less than one acre plot. Area indicated as a fraction of an acre.

FIGURE 13
GROUND SQUIRREL DAMAGE — FORT ORD

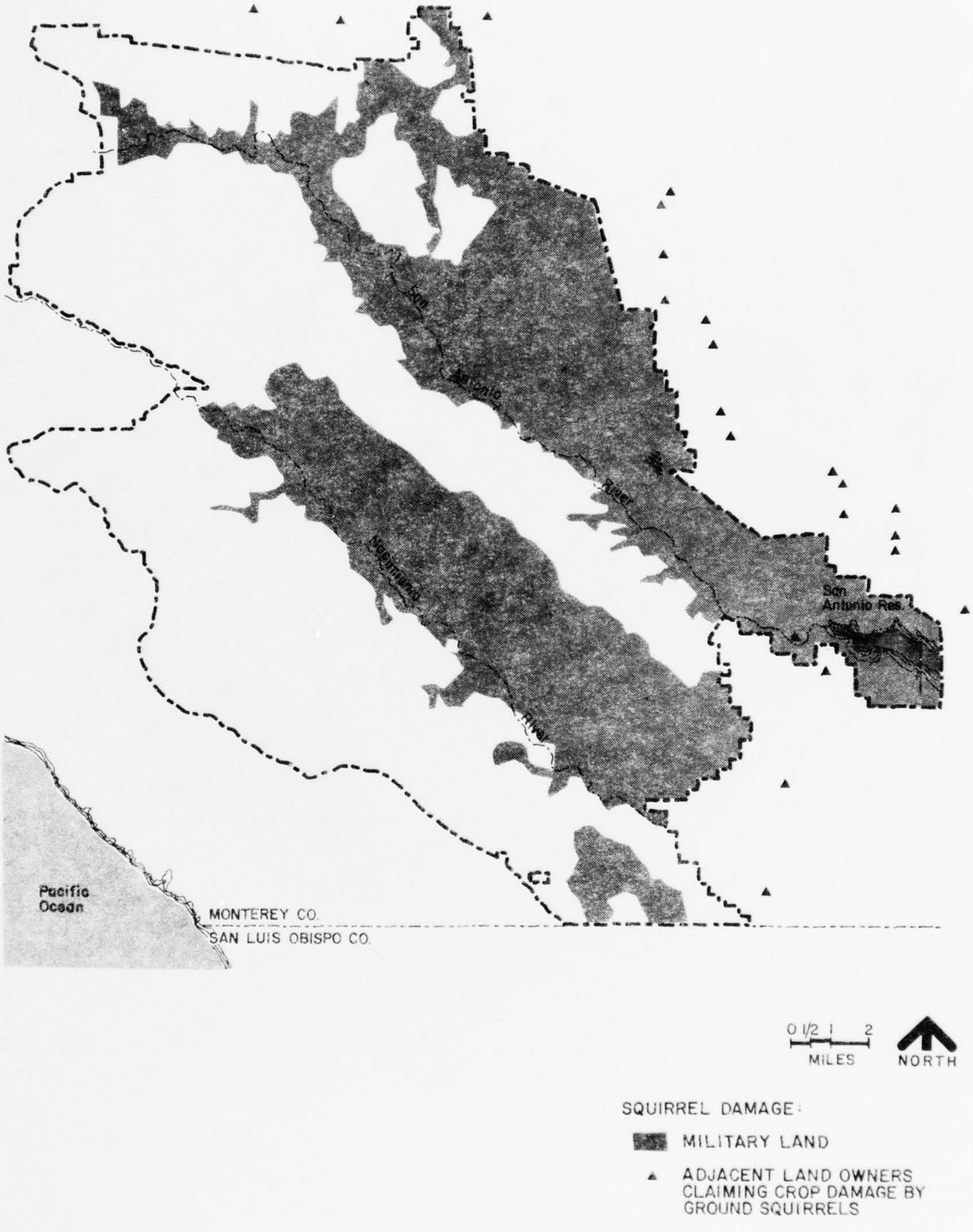


FIGURE 14
GROUND SQUIRREL DAMAGE AREAS ON MILITARY LAND AND ADJACENT PRIVATE LAND — FORT HUNTER LIGGETT

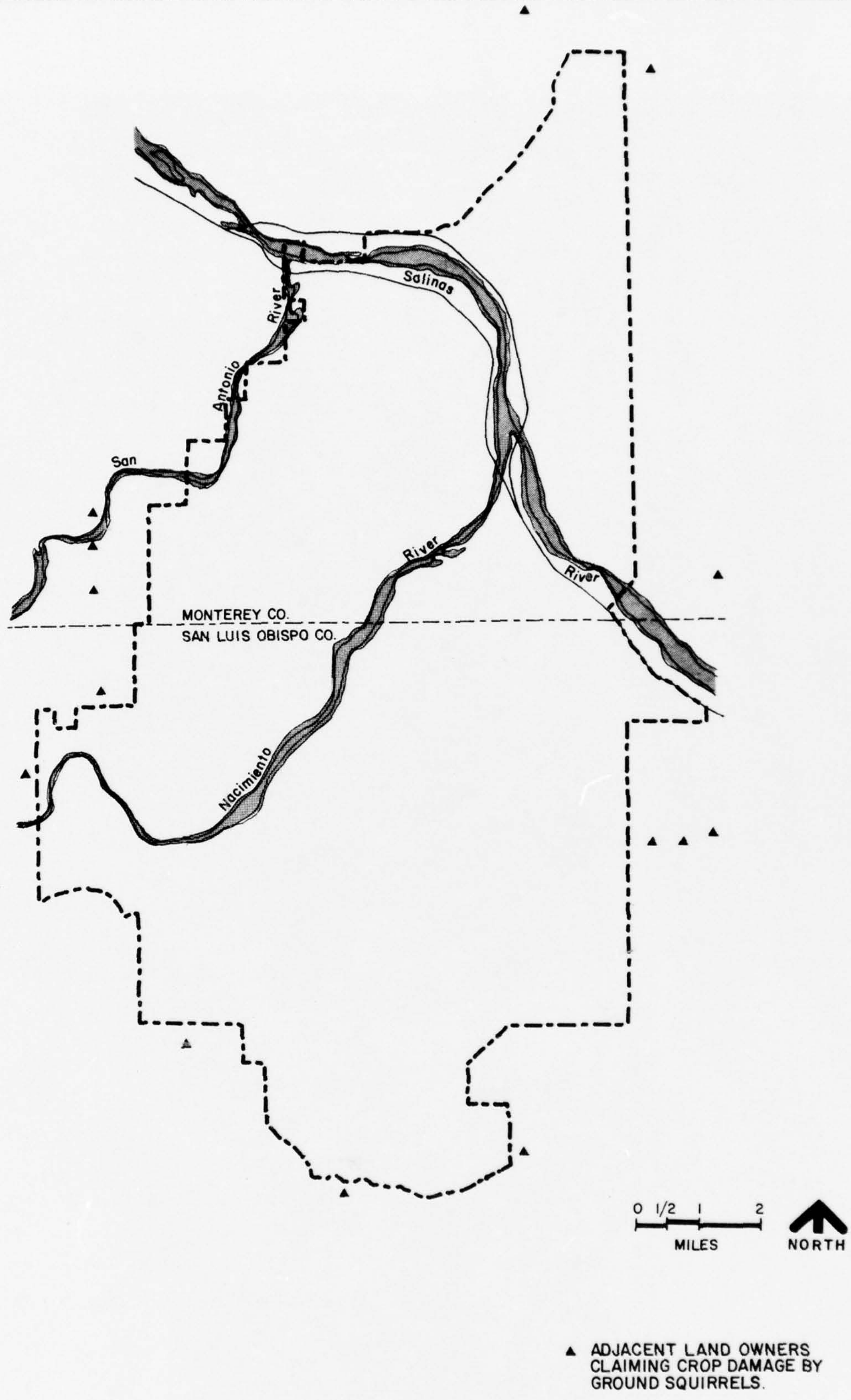


FIGURE 15
GROUND SQUIRREL DAMAGE AREAS ON ADJACENT PRIVATE LAND—CAMP ROBERTS (Ground squirrel damage-entire military area.)

Figure 16. Ground Squirrel Burrows Next to Air Strip Apron at Fort Ord

Figure 17. Ground Squirrel Burrows at the Base of a Radar Tower on Fort Ord

Liggett (Figure 18). Burrowing on both sides of the dam face during dry periods has caused a seepage loss of approximately 6 surface feet of water from one damaged dam on Fort Hunter Liggett (Walkley, pers. comm.). The cost to rebuild one dam reportedly washed out due to ground squirrel burrowing has been estimated at $20,000 (Figure 19). Earth-covered ammunition bunkers on Fort Hunter Liggett have also been excavated by ground squirrels (Figure 20) with an estimated cost of $54,000 to completely repair all damaged bunkers. Reinfestations by ground squirrels require continuous repair, which costs approximately $1,000 annually. Jones & Stokes Associates personnel have observed damage to road banks and surfaces as well as footpaths and sidewalks on all three installations (Figure 21). The estimated cost for continual repair of these surfaces is $2,000 annually on Fort Hunter Liggett. Ground squirrels have also extensively undermined concrete foundations around cantonment and bivouac buildings (Figure 22).

Ground squirrel burrowing and gnawing has caused considerable damage to the wiring and mechanisms of automated rifle firing ranges on Fort Hunter Liggett. The firing range was inoperative for 90 days during 1976 and the cost of range repair totaled $21,000. Similar damage also occurred on Fort Ord to underground wiring next to the airstrip. The estimated cost of repair and replacement of damaged wiring was $20,300. Damage to wiring at the sewage treatment plant on Fort Hunter Liggett has also been reported (Griffey, pers. comm.).

Recreational playing fields on Fort Ord and Camp Roberts which are continually mowed and thus provide excellent ground squirrel habitat are heavily infested. Jones & Stokes personnel observed an extremely high number of burrows (329/acre) on the baseball field at Camp Roberts. The resulting large holes and mounds of earth over twelve inches above ground level prevent most recreational use of this field (Figures 23 and 24). Other mowed areas around buildings and intersections of all three installations reportedly harbor squirrel populations and their burrows create hazards to pedestrians and horseback riders. Continued efforts to eliminate ground squirrels and repair their damage in their improved areas has cost $2,500 annually on Fort Hunter Liggett.

Marsh and Salmon (pers. comm.) have reported extensive damage to out-buildings and other structures on the San Antonio Mission grounds, which lie within Fort Hunter Liggett. Ground squirrel burrowing has damaged the adobe and stone wall which surrounds the Indian Cemetery (Figure 25). The grinding mill has also been extensively undermined (Figure 26). Other damage to stone walls and aqueducts on the mission has also occurred.

Ground squirrels reportedly damage a wide variety of crops including all kinds of grain, apples, apricots, peaches, prunes, oranges, tomatoes, nuts, dry beans, sugar beets, and alfalfa (Shaw, 1920; Tomich, 1962; California Department of Food and Agriculture, 1975). According to Dana (1967) damage to crops in California has been estimated at $8,000,000 annually. In Monterey and San Luis Obispo Counties combined, over $44,000 was spent in 1975 on poison baits to control these rodents on private land.

Many private landowners adjacent to Fort Hunter Liggett and Camp Roberts claim that ground squirrels coming from military lands have damaged their crops and pasture (Nutter, 1976; Kalar, 1976). Ground squirrels are known to shift with the availability of food wherever rangeland meets cropland (Horn and Fitch, 1942), and may travel on rangeland upwards of one quarter mile from their burrow systems to forage (Marsh, pers. comm.), possibly crossing from military to private cropland. Newbold (pers. comm.) recorded back and forth movements of approximately one quarter mile for tagged ground squirrels on Fort Hunter Liggett. Young squirrels that commonly disperse from the parent burrow system in the fall (Grinnell and Dixon, 1918) may travel from military land to private land and reinfest vacant burrow systems or occasionally establish new systems. Storer and Jameson (1965) indicate that some squirrels migrate 1 to 5 miles into new areas.

A survey on crop damage on lands adjacent to military property was conducted by the Monterey and San Luis Obispo County Departments of Agriculture in 1976 covering the period between 1972 and 1976 when no effective ground squirrel control program was conducted on military land. Land owners in Monterey County adjacent to Fort Hunter Liggett and Camp Roberts reported an estimated pasture and grain crop loss for the years 1972-75 of over $697,000 (Appendix C). Landowners adjacent to Camp Roberts in San Luis Obispo County claimed over $36,000 in crop damage between 1973 and 1976 chiefly to wheat, barley and pasture. These landowners also reported an extra expenditure of over $41,000 during the same years to control ground squirrel reinfestations from military lands (Appendix D).

Field observations by Jones & Stokes Associates personnel did not substantiate reported damage to adjacent crops or pasture because of the time of year (November). Crops had been harvested and most ground squirrels were inactive. However, ground squirrel colonies were present along the border between military land and adjacent cropland in many areas of Fort Hunter Liggett and Camp Roberts (Figure 27).

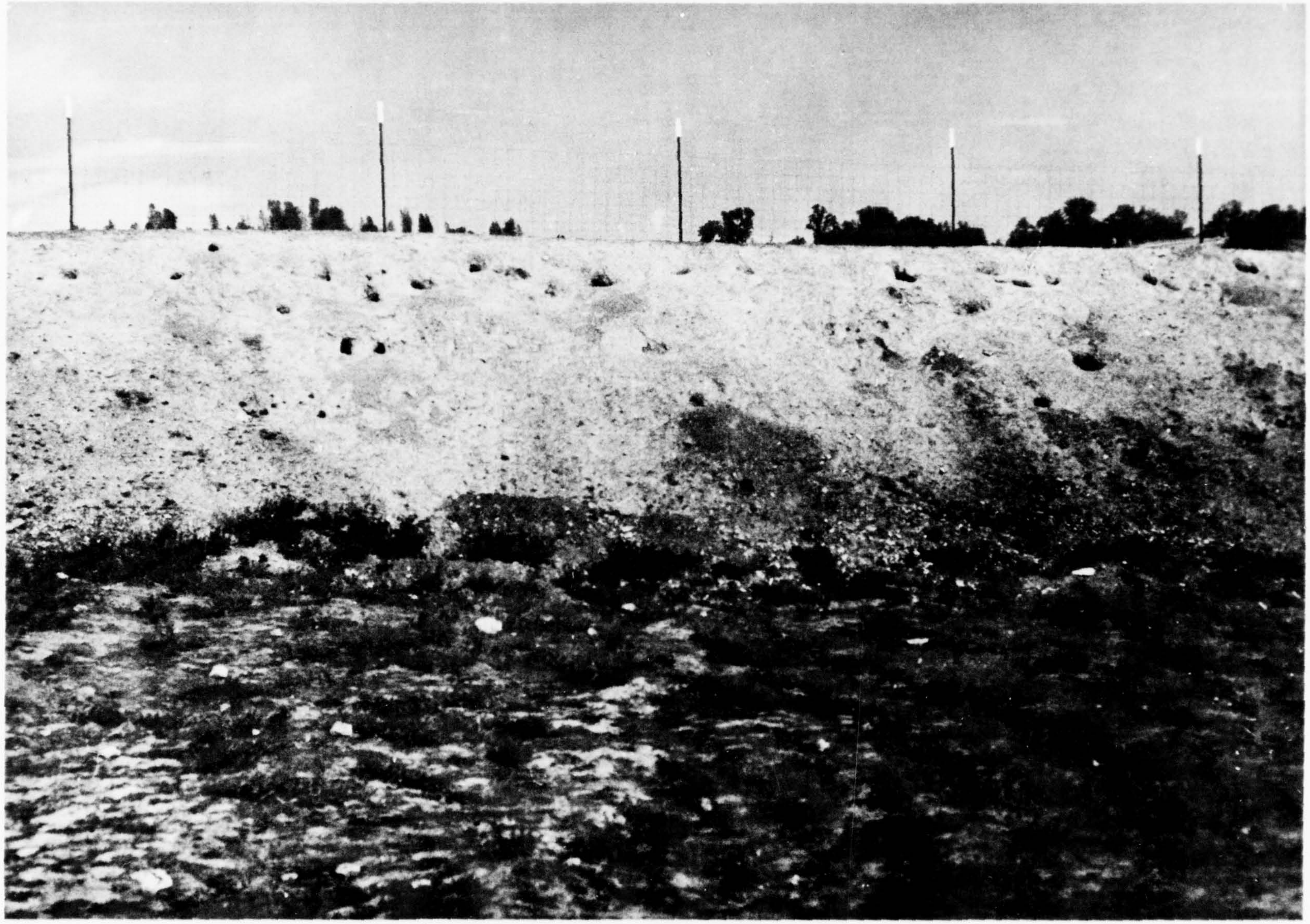


Figure 18. Ground Squirrel Burrows on an Earthen Dam Face at Fort Hunter Liggett

Figure 19. Earthen Dam With Washed Out Area at Fort Hunter Liggett

Figure 20. Ground Squirrel Burrows on an Ammunition Storage Bunker at Fort Hunter Liggett

Figure 21. Flagged Ground Squirrel Burrows on a Road Bank at Camp Roberts. NOTE: Repaired Pavement on Roadway.

Figure 22. Ground Squirrel Burrows Under a Bivouac Building at Fort Hunter Liggett

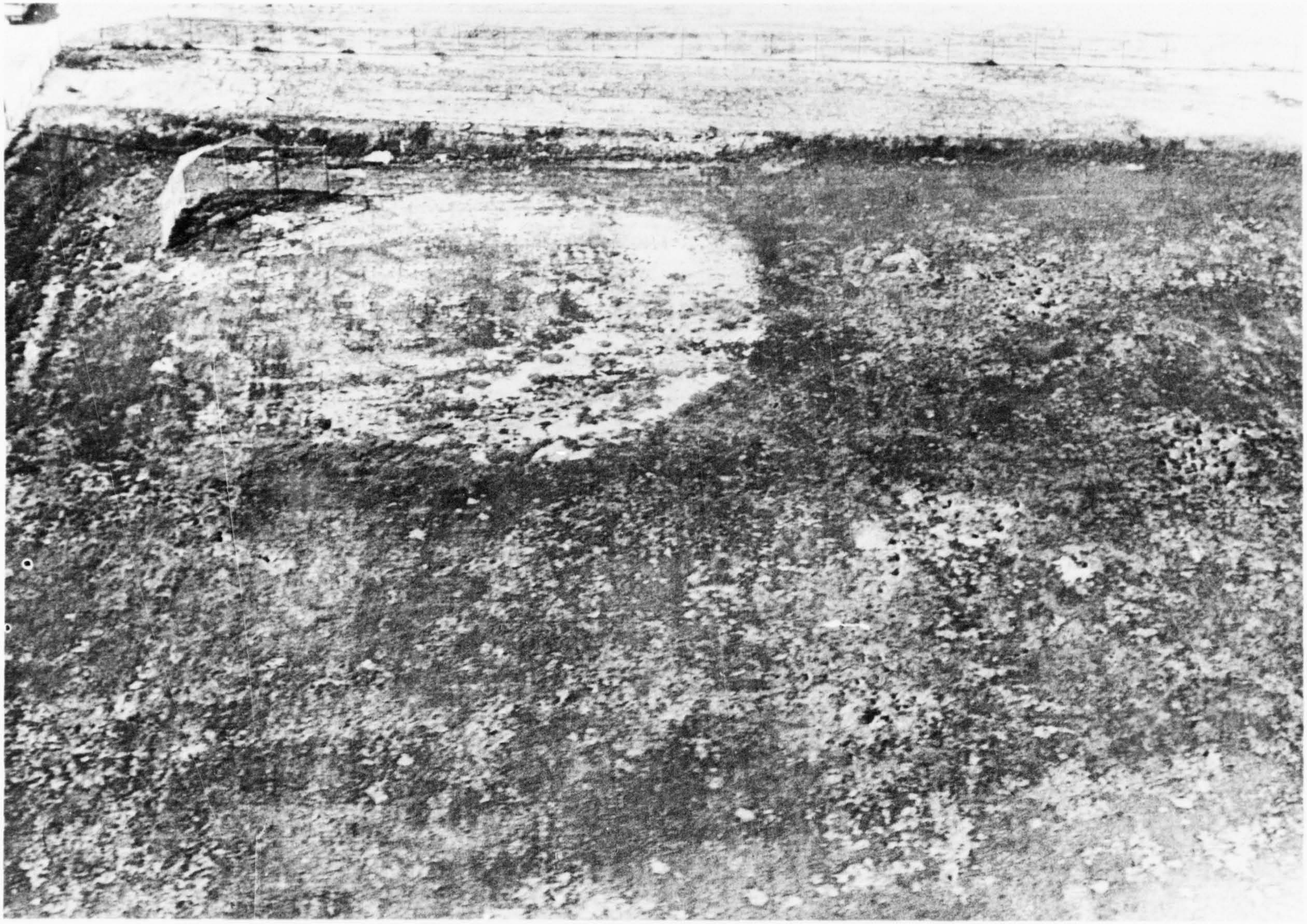


Figure 23. Aerial Photograph of Ground Squirrel Burrows on the Baseball Field at Camp Roberts

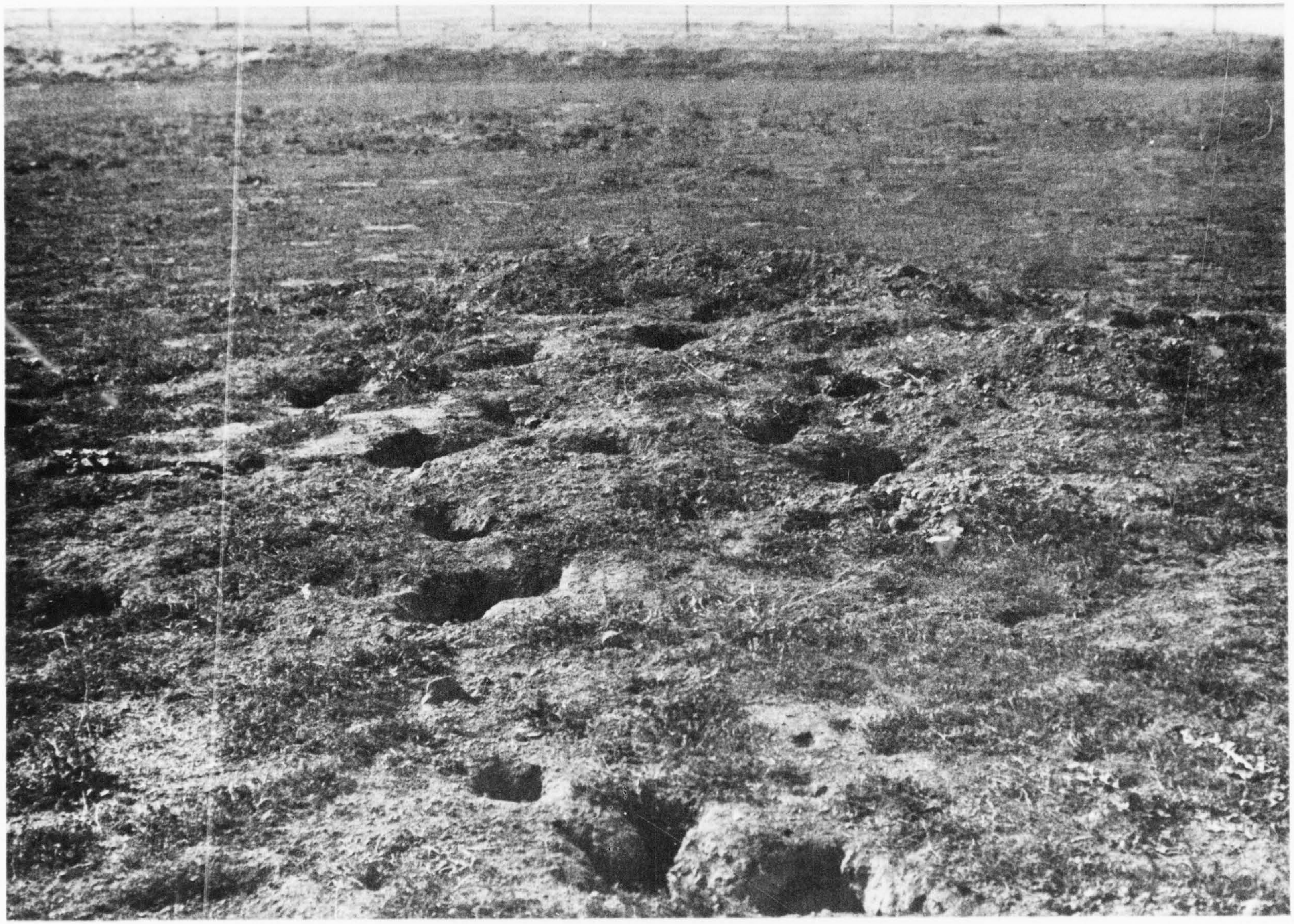


Figure 24. Close-up View of Ground Squirrel Burrows on the Baseball Field at Camp Roberts

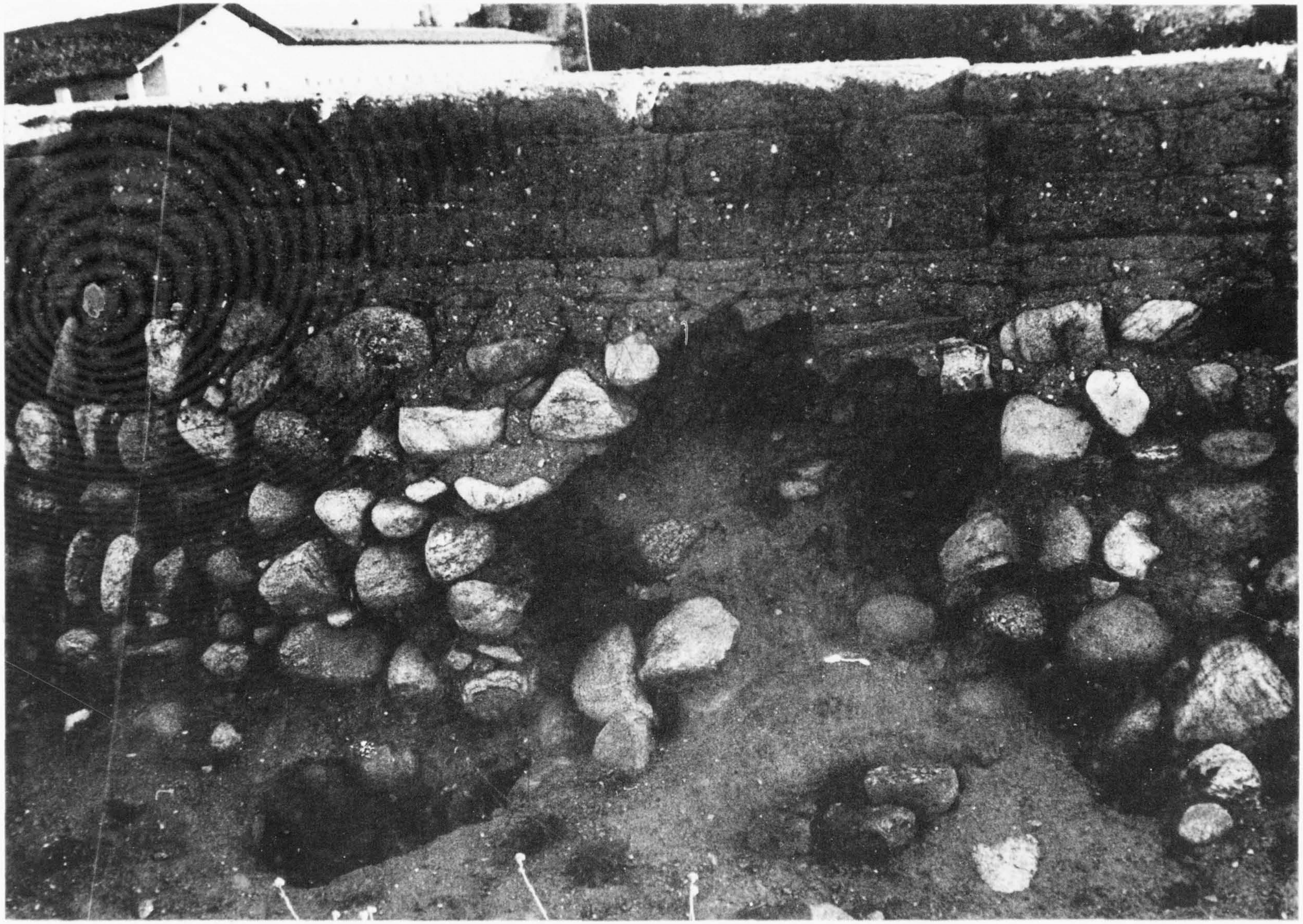


Figure 25. Ground Squirrel Burrows in the Adobe and Stone Wall Surrounding the Indian Cemetery, San Antonio Mission

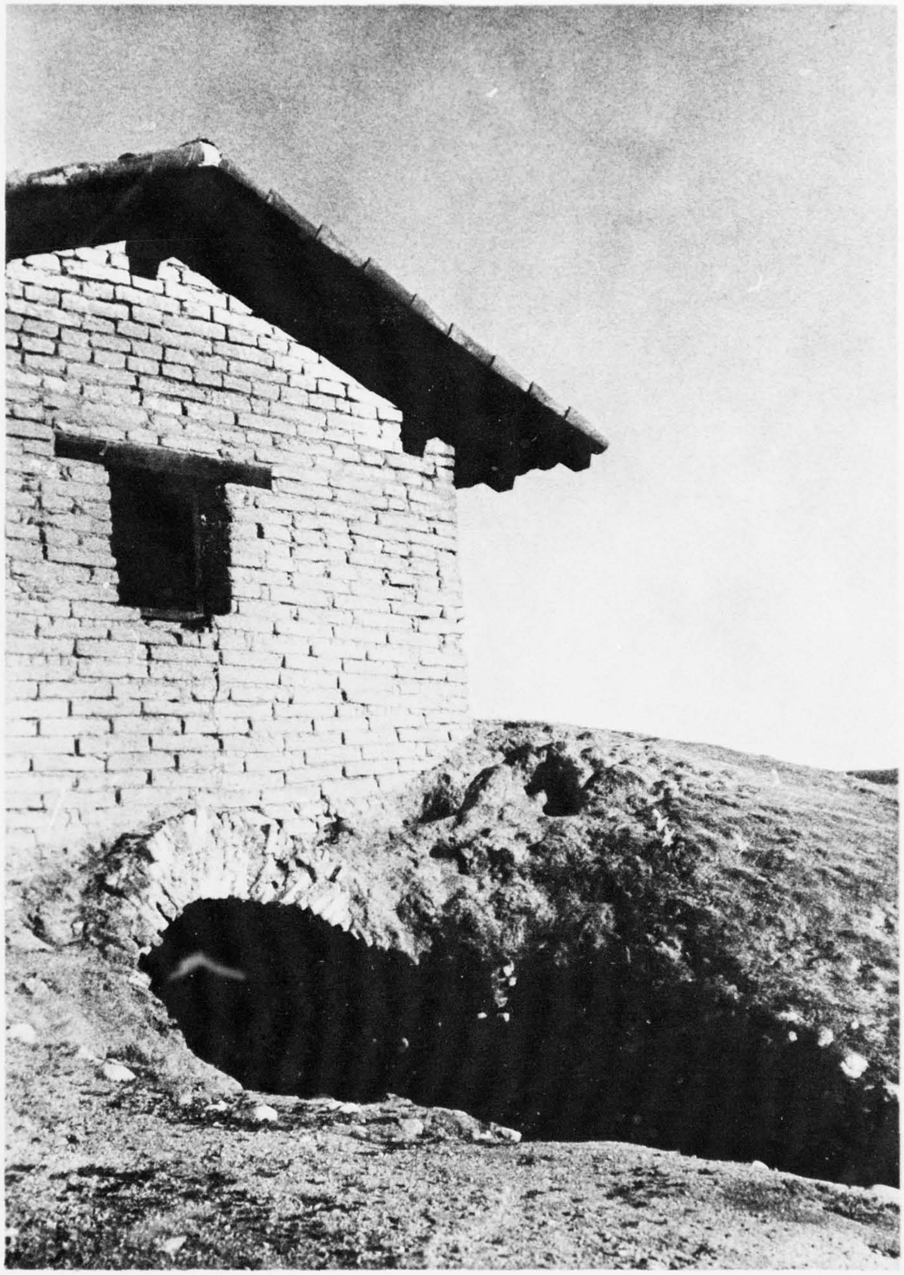


Figure 26. Ground Squirrel Burrows Next to the Grinding Mill at the San Antonio Mission on Fort Hunter Liggett

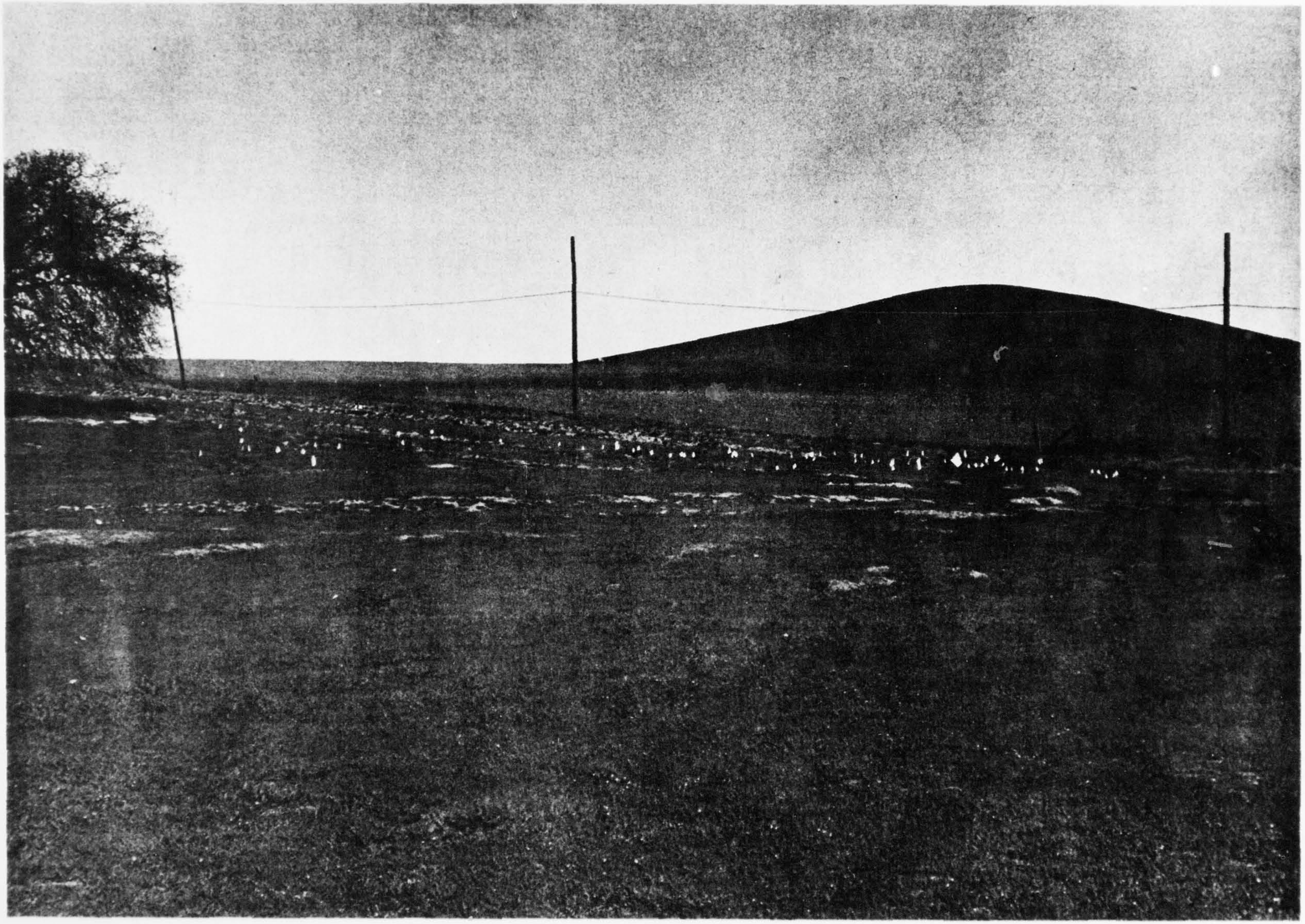


Figure 27. Flagged Ground Squirrel Burrows on Camp Roberts Adjacent to Private Grain Fields. NOTE: White Spots Depict Flagged Area.

The grazed rangeland (grassland and oak woodland) of Forts Ord, Hunter Liggett and Camp Roberts are prime habitat for ground squirrels (Grinnel and Dixon, 1918). Wherever large populations of ground squirrels occur on these rangelands the potential for damage to vegetation and competition between these rodents and livestock exists.

Ground squirrels damage the rangeland by cutting and discarding vegetation, trampling it, using it for nesting material, and covering it with soil from their burrow systems. Fitch (1948) found that ground squirrels could destroy up to 38 percent of rangeland yield in this manner. Their foraging activities in winter may also stunt the vegetation, thereby decreasing overall range production (Howard, 1953).

In addition to the forage ground squirrels destroy, they also compete with livestock for forage, especially for filaree and bur clover, both valuable range species. Grinnell and Dixon (1918) estimated that two hundred squirrels would eat as much as one steer and twenty squirrels as much as one sheep. Howard, et.al. (1959) showed that heifers grazing on pasture devoid of ground squirrels averaged a greater daily gain of 1.03 pounds than heifers grazed on squirrel-infested pasture.

Competition is most severe in fall, winter and early spring when forage growth is inadequate (Howard, et.al., 1959). Due to the ground squirrel winter hibernation, competition for forage may be limited during this time. In years of above average rainfall, however, competition between squirrels and cattle may be minimal (California Department of Food and Agriculture, 1975). Conversely, in dry years competition may be extreme throughout the livestock grazing season.

The foraging activities of ground squirrels may also promote the dissemination of seeds of noxious weeds (De Vos, 1969). Their selectivity in feeding may also result in the elimination or encouragement of certain valuable rangeland species (Fitch & Bentley, 1949). Ground squirrels also reportedly damage young orchards by gnawing on the bark. Jones & Stokes personnel observed numerous trees on Camp Roberts that may have died due to girdling of the tree base by ground squirrels (Figure 28). Bushes and other landscaping may also be damaged by their gnawing and burrowing habits. There have also been claims of damage to oak trees from extensive ground squirrel burrowing around their root systems. However, no direct evidence is available to substantiate this claim.

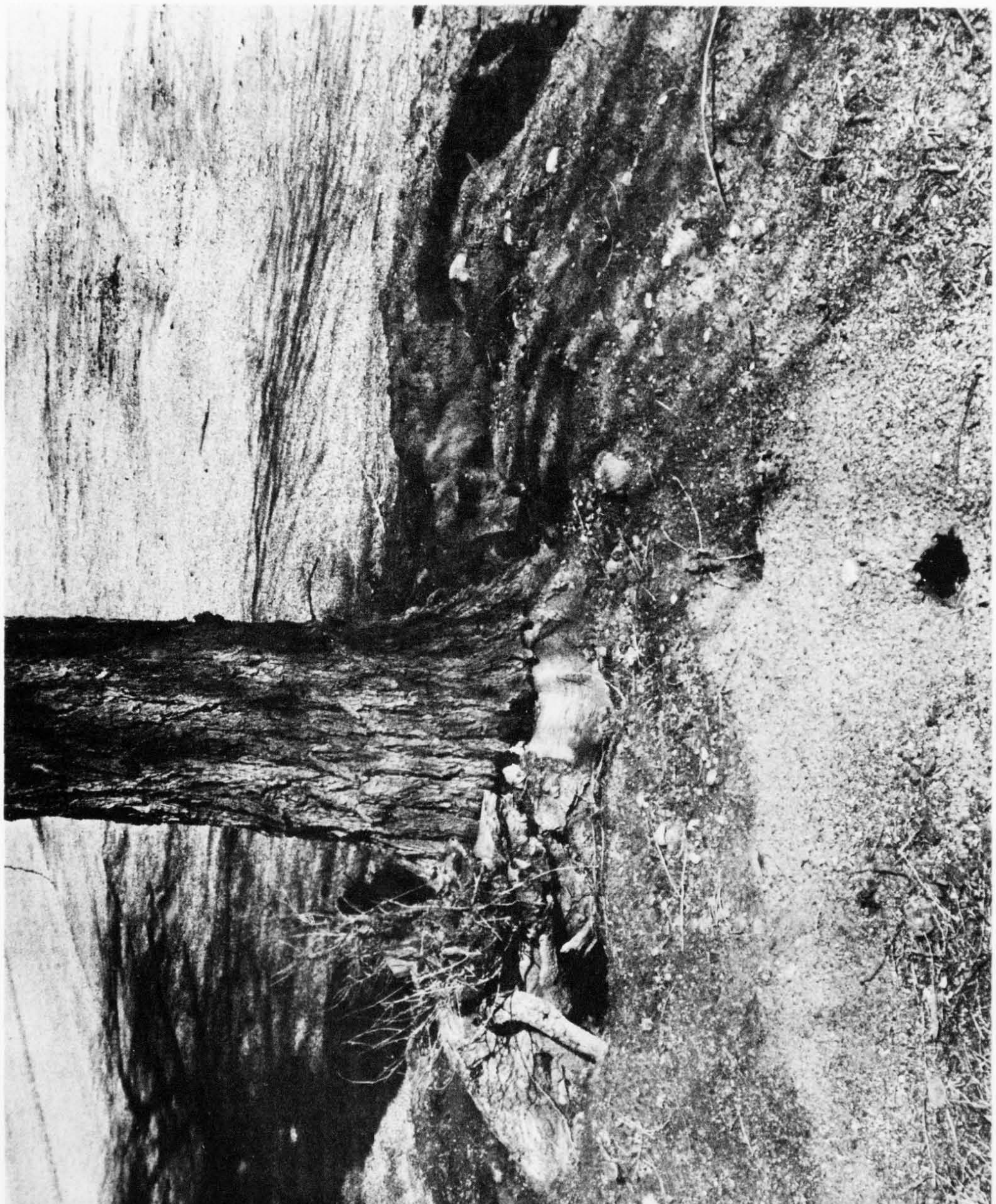


Figure 28. Girdled Tree on Camp Roberts

Another potential problem aggravated by ground squirrel burrowing is excessive erosion (Fitch, 1948; Longhurst, 1957). Surface runoff running down burrow systems accelerates erosion and may result in extensive subsurface erosion, cave-ins, and gullies (Howard, 1953). According to De Vos (1969) burrowing on open rangeland is not the primary cause of erosion, but instead is caused by a combination of factors.

No claims of erosion damage on open rangeland have been reported by the Army and Jones & Stokes personnel found no evidence of excessive erosion during field observations of each installation. Erosion of one dam face due to squirrel burrowing has been reported and the potential exists for pavement slippage or cave-ins wherever squirrels burrow into road banks.

The foraging activities of ground squirrels may affect other desirable wildlife species that share the same habitat. Ground squirrels are known to eat gopher snake eggs, young cottontails, and prey on the nests of killdeer, mourning doves and quail (Fitch, 1948 and California Department of Food and Agriculture, 1975). Glading (1938) found that the highest percentage of California valley quail nest loss (31 percent) was attributable to ground squirrels. Quail population levels have been high on Camp Roberts and Fort Hunter Liggett since 1972, but declined in the winter and spring of 1975 (Dedrick, 1976). This decline, however, was reportedly due to dry weather conditions and not to predations by ground squirrels. In a study by W. Francis (1970) in San Luis Obispo County, he found that 98.8 percent of the variation in population could be accounted for solely by weather conditions and the age structure of the quail population. Under normal environmental conditions, field studies have shown that ground squirrels are not highly detrimental to quail populations (Dedrick, 1976). There seems to be conflicting evidence on the effects of squirrels on quail populations and thus other factors may also be implicated.

Plague-Ground Squirrel Relationship

Plague

The following discussion is modified and abbreviated from the Manual for the Control of Communicable Diseases, 1971, compiled by the California Department of Public Health and other sources as indicated.

Plague is a highly infectious disease characterized by a number of symptoms, including acutely inflamed and painful swelling of lymph nodes, septicemia, and petechial hemorrhages, often with high fever, shock, mental confusion, delirium and coma.

Bubonic plague is the most common. Primary septicemic plague is rare, and primary pneumonic plague is the most serious. Untreated bubonic plague has a case fatality rate of 25 to 50 percent, untreated septicemic and pneumonic plague are usually fatal. Results are good if modern therapy is begun within 24 hours of onset, but are poor thereafter.

Sylvatic (wild rodent) plague is known to exist in the western third of the United States in addition to large areas in South America, Africa and Central and Southeast Asia.

Plague in man in the United States is limited to rare instances of exposure to wild rodents and their fleas.

Plague has been identified in California since 1900, and from 1900 to 1970, 413 human cases of plague with 28 deaths had been recorded from 21 counties. From 1940 to 1970, 13 cases with 5 deaths have been recorded (one a laboratory infection). All of them have been the bubonic form. Three cases of human plague have been reported in California, 1974-1976, and plague has been found in rodents (Table 9).

The infectious agent of plague is Yersina pestis (Pasturella pestis), the plague bacillus. The chief natural reservoirs of the plague are wild rodents, which are subject to periodic epizootics throughout the world. Certain kinds of mice (Microtus, Peromyscus) may serve as enzootic reservoirs. Bubonic plague is transmitted by the bite of an infective (blocked) flea, e.g., Xenopsylla cheopsis (rat flea), Diamanus montanus (common with ground squirrels), etc., or by contact with pus or tissues of an infected animal. The incubation period may be from 2 to 6 days.

Bubonic plague is not directly transmitted from person to person except through terminal plague pneumonia. Fleas may remain infected for days, months or even years under suitable conditions of temperature and humidity, or may clear themselves of infection (WHO, 1970). Certain infective (blocked) fleas are generally short-lived (3 to 4 days) (State Department of Public Health, 1971). According to Pollitzer (1954, Chapter 7), some infected fleas may live 80-206 days, the plague bacilli in the feces and stomachs remaining virulent. Blanc (1948), Blanc and Baltazard (1948) referenced in Pollitzer, have shown that the virulence of P. pestis is apt to remain unimpaired for prolonged periods even in dried up carcasses of plague fleas.

Preventative measures include: a) active immunization which is justifiable for persons traveling or living in areas of high incidence and which may confer some protection for several months but is not relied upon as the principal preventative measure; b) periodic surveys in endemic and potentially endemic areas to determine prevalence of rats and fleas, institute suppression methods, continue inspection and survey of wild rodents and their ectoparasites in areas of known sylvatic plague. Where plague is present or threatening, a systematic search for infected fleas and serologic surveys of rodents can further delineate the extent of the problem; c) other measures include rat-proofing buildings and reduction of breeding places and harborages, together with education of the public in endemic areas on mode of transmission and protective measures against fleas and rats. Additional discussion may be found in Kartman (1975).

In addition to control of patients, there should be a search for infected rodents and fleas or persons exposed to plague pneumonia. Elimination of fleas should precede anti-rat measures. Rat populations should be suppressed by energetic campaigns of poisoning or trapping.

General Background

Plague infection in wild rodents and their fleas has been demonstrated widely in California. Prominent areas have been: coastal counties from San Francisco Bay southward; San Bernardino Mountains; Siskiyou, Modoc, Plumas, Shasta and Lassen Counties; Sierra Nevada and Tehachapi Mountains. Most plague epizootics involve species of ground squirrels (*Citellus*), now called *Spermophilus*, or chipmunks (*Eutamias*). Sporadic human cases of sylvatic origin usually are a consequence of epizootics in these animals (California State Department of Health, 1971).

> Epizootics of plague among wild rodents move silently and are frequently not apparent in nocturnal, solitary species. They are more easily recognized in susceptible diurnal, colonial species, especially when these are in proximity to areas of human activity. Epizootics may be recognized by the presence of sick or dead rodents from which *Y. pestis* can be demonstrated. These organisms also may be present in fleas from carcasses or from abandoned rodent burrows and nests. In spite of often heavy mortality, carcasses may not be readily evident owing to predation and cannibalism. Consequently, epizootics of plague sometimes may only be demonstrated by serological methods (antibody titers) and by observation of decreased rodent activity substantiated by trap-capture data in a given area.

> Serological procedures are essential in detecting plague activity in enzootic rodent reservoirs, in rodents that show heterogeneity in their resistance to plague, and in individuals of a susceptible species that occasionally may survive the infection....Monitoring of activity and inactivity of various rodent species is important in assessing the extent of an epizootic in a given area. Detailed knowledge of the rodents involved is necessary to read and interpret sign accurately. (Nelson and Smith, 1976).

The Fort Ord complex is located in an area of California in which sylvatic plague has been found.

Eskey and Haas (1940) stated that the ground squirrels constituted one of the great primary reservoirs* of plague in the western United States. Subsequent workers, however, have found that the primary reservoirs appear to be in *Microtus* spp. and *Peromyscus* spp., and that the ground squirrel becomes infected through contact with infected populations of deer mice, meadow voles, etc. (Olson, 1970; Nelson and Smith, 1976; and Kartman, 1958).

Murray (1963) has listed ecological conditions necessary for the occurrence and persistence of plague.

1. Persistent reservoirs of plague are not those species involved in violent epizootics, but relatively resistant species in which the disease organism is adapted. Much of the infection may remain in a latent state.

2. Enzootic plague persists in foci or pockets. These pockets are relatively small and persist where suitable climate (characteristically in cold mountains, high plateaus, or coastal fog belts), suitable flea vectors, and suitable rodent hosts occur.

3. Epizootics occur when infection transfers to susceptible species of relatively high density. Such epizootics may be brief and limited or may follow an ever-shifting path for years.

4. High density of susceptible populations is a prerequisite for epizootics; physiological stress from overcrowding may be important in activating latent enzootic infections.

The following brief statements are taken from Pollitzer (1954).

---

* "Amplifying host" may be a more accurate description.

The low incidence of human infection derived directly from the wild rodents or through their fleas is in striking contrast to the large area comprising 131 counties in 15 states, where evidence of plague among these animals has been found. (Page 52).

While...the danger of a spread of plague to man through direct contact with wild rodents or through their fleas is slight, secondary involvement of the rats or other rodent species living near man might greatly enhance the chances for human infection. (Page 53).

...Lobo and Silvetti (1941) [state that]...the fundamental differences between rat-caused and wild rodent plague is that the presence of the infection among the rats is apt to lead to the appearance of collective human cases in settlements, whereas wild rodent plague in the strict sense is, as a rule, responsible merely for the occurrence of sporadic cases in persons who have entered the haunts of the species concerned. Nevertheless, in view of the often enormous extent of the wild rodent plague foci, the aggregate number of human infections contracted in them may be considerable, and the case-mortality is apt to be high since the patients often receive no adequate treatment, either because they live away from centers of civilization, or because, owing to its sporadic incidence, the presence of the disease is not recognized. (Page 499).

According to Meyer (1942) epizootics among the ground squirrels, which led to the appearance of sporadic plague cases in man, began early in spring, rose in intensity during the summer months, and slowly declined during autumn to disappear entirely during the winter in regions where the animals hibernated. However, in some localities, young ground squirrels, which were apt neither to aestivate nor to hibernate, could be found plague-infected in December and January. (Page 489).

The disease in the bubonic form is not where the major threat or concern lies. The most dangerous public health issue relates to the disease in the pneumonic form in man. It is in this stage that rapid spread of the disease can occur from man to man by droplet infection.

Of the 36 plague cases contracted in the western United States in the last two years, 8 have developed into rarer pneumonic plague. This increase in pneumonic plague is a most unusual situation which cannot be fully explained. A change in virulence has been suggested but other factors could be responsible. Twigg (1975), with reference to plague, stated that there is absolutely no reason why a new form of extraordinary virulence should not appear somewhere in the world. The death of a Fresno, California, man last year was a pneumonic case which required a follow-up prophylactic treatment of 73 persons who were believed to have had sufficient contact with the infected man to have been exposed.

Observations at Fort Hunter Liggett

A team from the Letterman Army Institute of Research, headed by Dr. M. A. Moussa of the Department of Tropical Medicine, studied the ecology and control of sylvatic plague at Fort Hunter Liggett from November 1974 to September 1976. Fort Ord and Camp Roberts were visited, but no studies were conducted.

Ground squirrels at two sites on Fort Hunter Liggett (Figure 29) were trapped and released on a regular schedule for one year to determine ground squirrel population dynamics and make flea counts (Figure 30). Short-term collections of ground squirrels and other rodents were conducted in other areas, and counts were made of hosts and fleas (Table 7).

Blood samples were taken from all those ground squirrels captured and sent to Walter Reed Army Research Institute to determine if sera showed evidence of plague. Fleas were also sent.

Carnivores and small rodents and lagomorphs were also collected and sera was sent to Walter Reed Army Research Institute for immunological tests for plague. Table 8 lists the preliminary serological (plague) findings made by Walter Reed Army Research Institute on sera taken from the animals collected and sampled at Fort Hunter Liggett. A positive titer for plague was found in the sera of a number of the carnivores tested, and an uncertain reaction in one ground squirrel, one bobcat and three dogs. No plague has been reported to date by Walter Reed Army Research Institute concerning the 31,000 fleas (pooled samples) tested (mostly taken from California ground squirrels). Sera from a number of other rodents all have been negative.

Discussion

The recent literature suggests that ground squirrels in California are not a permanent reservoir of the plague, but rather that deer mice, meadow voles, etc. are probably the natural plague reservoirs* (Olson, 1970; Nelson and Smith, 1976; and Kartman, 1958).

It is not known for certain whether some ground squirrels infected with plague can survive and thus maintain a plague reservoir* (Olson, 1970; and Kartman, 1958).

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* "Amplifying host" may be a more accurate description.

Table 7

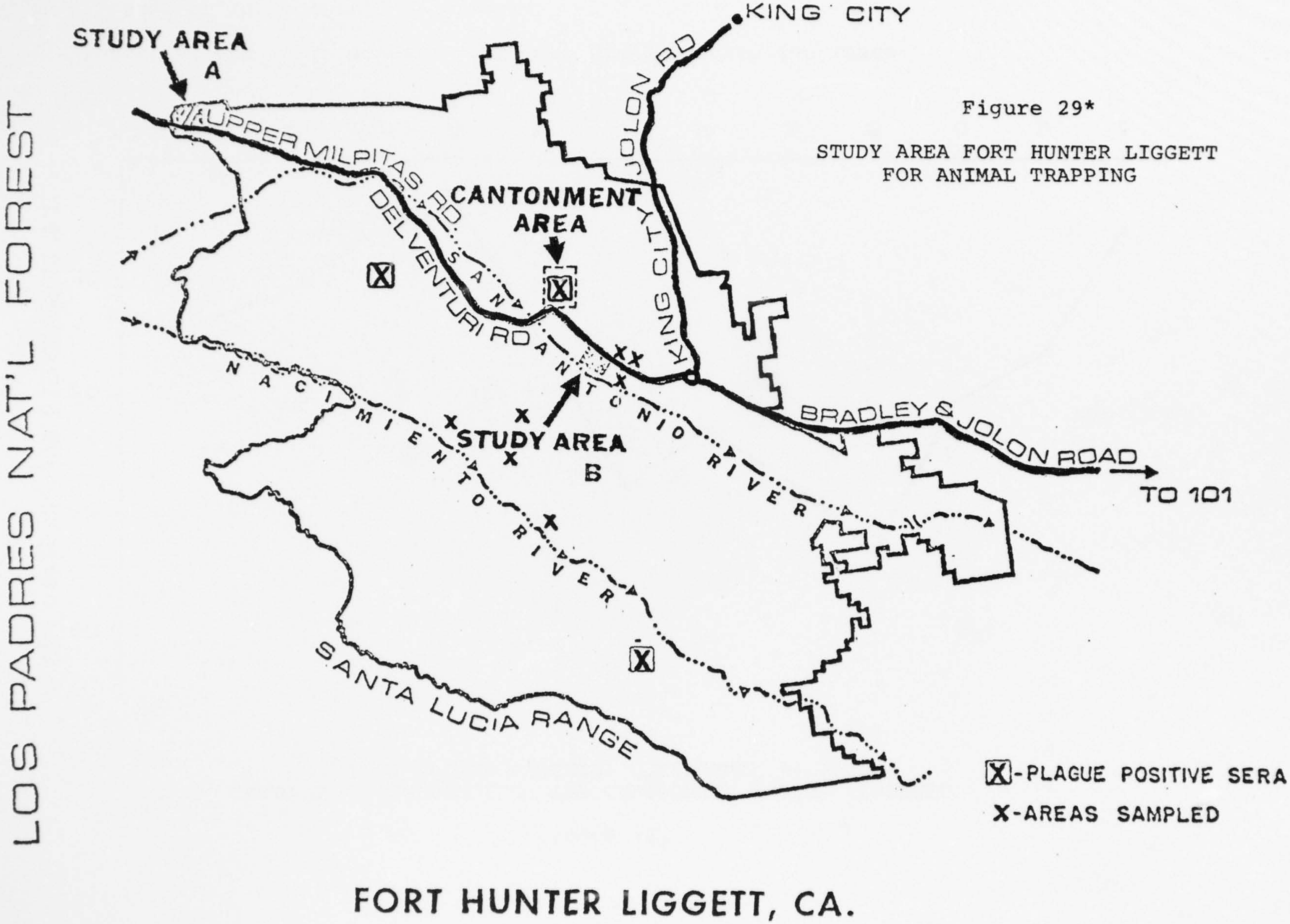
FLEA-HOST ASSOCIATIONS AT FORT HUNTER LIGGETT
(November 1974 - August 1976)

Animal Host	Number Examined	Diamanus montanus	Hoplopsyllus anomalus	Malaraeus telchinus	Atyphloceras multidentatus	Monopsyllus wagneri	Peromyscopsylla ravalliensis	Orchopeas sexdentatus	Pulex simulans	Cediopsylla inaequalis	Ctenocephalides felis	Hoplopsyllus foxi	Anomiopsyllus congruens	Dactopsylla bluei
California ground squirrel Spermophilus beecheyi	1,732	x	x						x					
Brush mouse Peromyscus boylei	30		x	x	x	x	x							
Deer mouse Peromyscus maniculatus	25	x		x		x								
California vole Microtus californicus	9		x	x		x								
California pocket mouse Perognathus californicus	17		x				x							
Desert wood rat Neotoma lepida	4							x						
Desert cottontail Sylvilagus auduboni	3		x					x		x				
Kangaroo rat Dipodomys venustus	23													
Gray fox Urocyon cinereoargenteus	1								x					
Bobcat Lynx rufus	3								x			x	x	x
House cat (feral) Felis domesticus	4										x			

Source: Lt. Col. M. A. Moussa, Ph.D.

Figure 29*

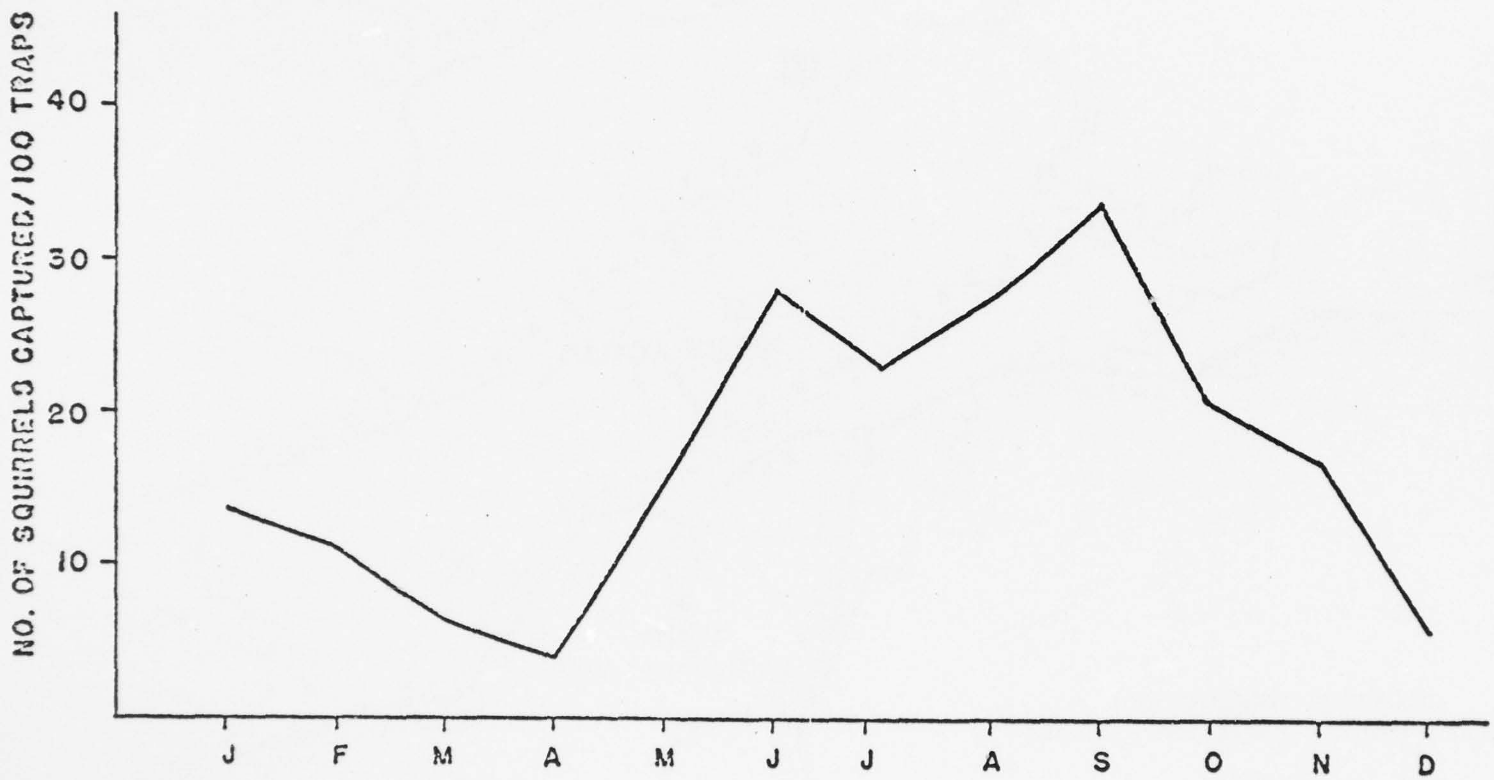
STUDY AREA FORT HUNTER LIGGETT
FOR ANIMAL TRAPPING



* Source: Lt. Col. Moussa, Letterman Army Research Institute.

Figure 30*

SEASONAL OCCURRENCE OF THE CALIFORNIA GROUND SQUIRREL
AT FORT HUNTER LIGGETT, CALIFORNIA -- 1975**

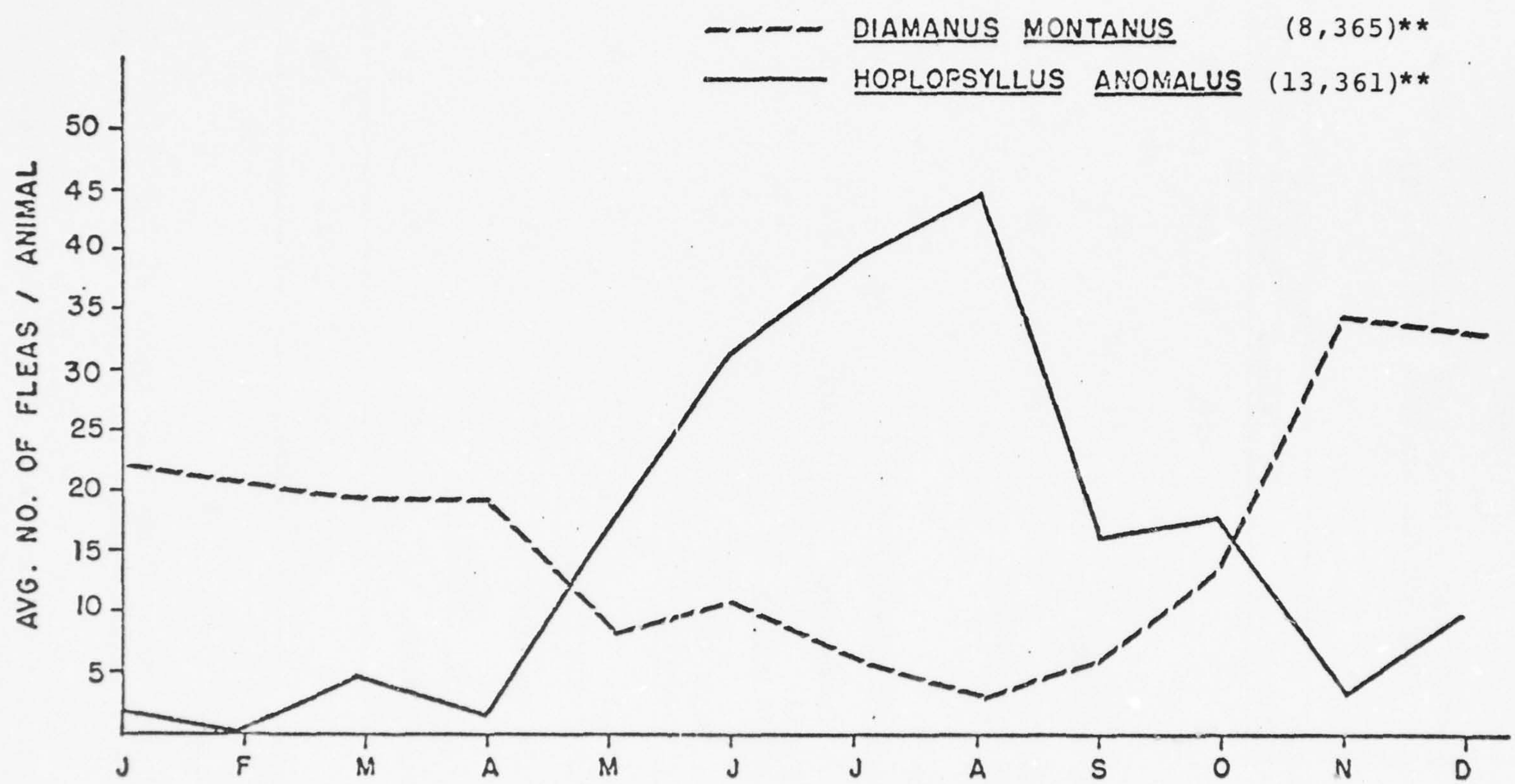


* Source: Lt. Col. Moussa, Letterman Army Research Institute.

** Based on total of 620 squirrels.

Figure 31*

FLEA POPULATIONS ON THE CALIFORNIA GROUND SQUIRREL
AT FORT HUNTER LIGGETT, CALIFORNIA -- 1975



* Source Lt. Col. Moussa, Letterman Army Research Institute.

** Total number.

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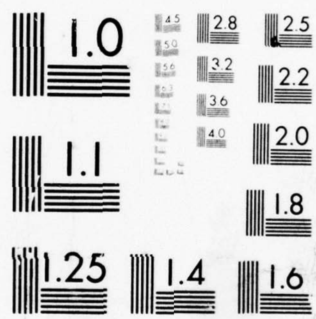

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-

Table 8

SEROLOGICAL FINDINGS OF PLAGUE IN MAMMALS AT FORT HUNTER LIGGETT (1975-1976)

Common Name Scientific Name	No. Sera Collected	Tested	Positive	Titer
Bobcat *Lynx rufus*	16	12	1	1:8**
Coyote *Canis latrans*	11	11	2	1:256 1:28*
Dog (domestic) *Canis familiaris*	32	32	9	1:16(5) 1:8(3)** 1:64(1)
Gray fox *Urocyon cinereoargenteus*	7	4	0	N/A
House cat (domestic and feral) *Felis domestica*	14	14	1	1:16
Mountain lion *Felis concolor*	4	3	0	N/A
Striped skunk *Mephitis mephitis*	1	1	0	N/A
California ground squirrel *Spermophilus beecheyi*	971	871	1	1:8**
Other small rodents	83	81	0	N/A
Total	1,139	1,029	14	N/A

* Probably 1:128.

** Uncertain according to criteria of California Department of Health or Plague Laboratory CDC, Ft. Collins (comment added).

Source: Lt. Col. M. A. Moussa, Ph.D., Department of Tropical Medicine, Letterman Army Institute of Research, Presidio, San Francisco, California.

The probable method of sylvatic plague transmission is transference of infective fleas from wild rodents, such as field mice, deer mice, etc. to ground squirrels, which then results in an epizootic. Generally the ground squirrel is highly susceptible to plague infections and the population is drastically reduced.

Infective fleas leave dead rodents and may infect available new hosts (Smith, et.al., 1968; Pollitzer, 1954, page 385; Westrum and Yescott, 1975, pages 97-103; Stark and Kinner, 1962, pages 249-251). Since this may lead to an expansion of the plague into new areas and new hosts, including man, public health officials generally recommend that rodent (squirrel) control be accompanied by flea control (Lackner, 1976).

> In general, measures taken to reduce the human plague potential in an area should be directed against the flea vectors as well as the vertebrate hosts; flea control itself has become an important technique in combating plague by interfering with or breaking the normal rodent-flea-rodent transmission chain. If rodent control alone is practiced, the situation may be made worse since large numbers of hungry fleas remain, which could shift from their normal hosts to man or would attack new rodent hosts as soon as they entered the area; under conditions of high population pressure this might be an immediate influx. (Olson, 1970, page 210).

The plague will still remain in other rodents even though the ground squirrels are all killed.

There are very high populations of ground squirrels on the Fort Ord complex with large numbers of fleas, particularly *Diamanus montanus* and *Holopsyllus anomalus*, which are known to carry the plague organism. Specimens are found on ground squirrels at all times of the year in varying numbers (Figure 31). The average flea index is about 30. The flea index on citellids from an area associated with human plague in New Mexico is about 2 (Table 9).

Much of the Fort Ord complex is open to the public. Public use is high, and if ground squirrels succumb to plague, there will be a large number of fleas which may transfer to humans in certain field situations, such as recreation.

At Fort Hunter Liggett all of the factors appear to be present which may lead to a plague outbreak.

As summarized by the Surgeon General's office (August 17, 1976 meeting), the present circumstances include:

Table 9

FLEA INDICES ON RODENTS TRAPPED IN CONNECTION WITH CASES OF HUMAN PLAGUE, NEW MEXICO, 1974-1976

Flea Indices by Month

Month	Cases	All Rodents	Fleas	Index	Citellids	Fleas	Index
January	0	--	--	--	--	--	--
February	1	13	20	1.54	0	--	--
March	0	--	--	--	--	--	--
April	1	59	54	0.92	4	17	4.25
May	--	--	--	--	--	--	--
June	1	24	75	3.13	7	54	7.71
July	2	128	173	1.35	19	91	4.79
August	3	139	122	0.88	17	4	0.24
September	8	384	445	1.16	111	166	1.50
October	2	71	61	0.86	17	9	0.53
November	1	32	27	0.84	1	0	0.00
December	1	26	2	0.08	0	0	0.00
TOTALS:	51	876	979	1.12	176	341	1.94

Source: New Mexico State Department of Health and Social Services.

REPORTED HUMAN PLAGUE CASES BY YEAR, UNITED STATES 1950-1976

Year	Cases	Year	Cases	Year	Cases
1950	3	1959	4	1968	3
1951	1	1960	2	1969	5
1952	0	1961	3	1970	13
1953	0	1962	0	1971	2
1954	0	1963	1	1972	2
1955	0	1964	0	1973	2
1956	1	1965	8	1974	6
1957	1	1966	6	1975	20
1958	0	1967	3	1976	16

Source: U. S. Public Health Service/Center for Disease Control Publications.

1. A highly abundant, susceptible host species overrunning the areas in which people live, train, work and play.

2. High flea counts on the rodent hosts.

3. A marked increase this year in the occurrence of epizootic plague and human cases throughout the western states, including California.

4. Evidence by carnivore serology of the existence, right now, of plague foci at the Fort Ord complex or in the vicinity.

A summary (Table 9) shows that the overall incidence of plague cases has increased in recent years in the United States. The problem, therefore, may be much broader than at the Fort Ord complex (August 17, 1976 meeting).

The California State Department of Health has expressed its concern about the Fort Hunter Liggett situation in a letter to the office of the Surgeon General as follows:

> With plague circulating in the area of Hunter Liggett, as evidenced by carnivore serology, it appears that the disease at some time in the future will enter into the highly susceptible ground squirrel population. Plague epizootics and human exposure have occurred in this area in the past. Plague occurrence has not been documented at Camp Roberts, but epizootics in past years may have occurred there undetected. (Lackner, 1976).

<u>Summary</u>

1. Plague is a serious disease which is endemic in populations of wild rodents in California and worldwide.

2. Human cases of plague of probable sylvatic origin have been reported in California since 1920.

3. Sylvatic plague is present in some hosts in or near the Fort Ord complex as demonstrated by positive serology of carnivores collected and tested in the area.

4. All the factors necessary for a plague outbreak are present in the Fort Ord complex area.

5. Plague is known to infect ground squirrels and to drastically reduce population.

6. Flea control should precede or accompany ground squirrel control in order to minimize further spread of plague infection.

The following paragraphs reflect the position of the State Department of Public Health with respect to ground squirrel and flea control in plague-related situations. The discussion is based upon communications with Dr. Bernard Nelson and material which was presented by Dr. Nelson to Army personnel at a meeting at Fort Hunter Liggett in April 1976.

The policy of the Vector Control Section of the California Department of Health toward control of ground squirrels is as follows: ground squirrel control is not supported on lands where proposed reasons for control are based upon actual or threatened crop damage or grazing competition with livestock. This is an agricultural problem to be handled through decisions made by agricultural officials. Likewise, control of ground squirrels that cause structural damage to levees, earthen dams, bunkers, etc., is a decision to be made by persons involved in maintenance of these structures.

The California Department of Public Health is mandated by law and international agreements to monitor the occurrence of plague throughout California. The beechey ground squirrel is highly susceptible to plague organisms and undergoes violent epizootics, often killing most or all members of a colony. The ground squirrels make good sentinel animals since the presence of sick animals or carcasses of these rodents is usually a good indication of a current epizootic of plague. These episodes are usually observed by the general public and reported to the State Department of Public Health, whereas a plague epizootic among forest rodents goes unnoticed and is more time-consuming and difficult to monitor. The work of the Public Health Department is made easier if ground squirrels are not poisoned.

When the State Department of Public Health officially states that a population of ground squirrels is a public health problem, the program to prevent human infection is basically as follows:

1. Recommendations are made to officially or unofficially quarantine the designated area. Unofficial quarantine is suggesting that ranchers keep their men, family and pets out of the area. Official quarantine is closure of campground, parks, etc., that are under county, state or federal control.

2. Surveys are (or have already been) performed to establish the limits of the problem area.

3. Flea control measures are undertaken, followed 7 to 14 days later by a post-treatment evaluation of the control.

4. If ground squirrels are above the carrying capacity of the area, and the number still poses a direct public health problem, then ground squirrel control measures are undertaken.

The Public Health Department does not support or participate in large areawide flea and rodent control. The Department deals with the problem in that area where, in their opinion, there is sufficient and frequent enough human contact with ground squirrels and their fleas to be a human health hazard.* Flea and rodent control take place at the interface between the ground squirrel and humans; this includes areas such as campgrounds, recreational areas, bivouacs, some ranches, etc. The Department stipulates that flea control and evaluation of control must precede rodent control. It is unnecessary to control a large area where human-ground squirrel contact is low or absent.

Formerly several effective insecticides were available, namely DDT, dieldrin, aldrin, malathion, benzene hexachloride and heptachlor. These are no longer available for use against fleas in plague control.

In the summer of 1976, the State Department of Public Health treated several campgrounds in California with DDT (under emergency exemption) to control fleas during observed plague epizootics among chipmunks, in which two human cases were reported. Excellent control was achieved and the program was effective.

There is now only one insecticide available for flea control -- carbaryl (Sevin). It is the only one registered with EPA (5 and 10 percent) and with a label. It must be dusted directly into burrows with hand dusters and in order to be effective, one ounce of 5 percent carbaryl must be dispensed <u>into</u> each burrow to achieve control (Krishna Murthy, et.al. (1965), Miller, et.al. (1970) and Barnes, et.al. (1972).

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* Parts of Fort Ord complex offer an excellent example of this type of interface where human contact with ground squirrels and fleas will occur.

Public Health flea control efforts using carbaryl at the Lava Beds National Monument in March 1973 and at Lake Davis (Plumas County) (1975) were not effective.

Subsequent studies by Stegmiller and Hawthorne (1975) indicated the crucial role that pH occupies in the efficacy of carbaryl -- an acid condition apparently is necessary for effective residue life. Later studies by the State Department of Public Health at Lake Davis indicated that the acid formulation appeared to give adequate control, but was not effective in preventing the spread of plague within the ground squirrel population.

Three insecticides show promise under experimental conditions -- Phoxim and trichlorofon (Dipterex) as systemics (Moussa, 1976) and dichlorvos as a vapor toxicant. These materials are at least a year away in respect to registration and may have limited applications.

The California Department of Public Health is currently using carbaryl at specific bait stations and achieving very good control of fleas on mice and wood rats in the Lava Beds National Monument (Nelson, 1977).

During 1976, extensive areas in Arizona, Colorado, New Mexico and Wyoming were treated with 10 percent carbaryl dust applied to squirrel burrows for flea control; few failures occurred, and all were traceable to errors in application resulting in failure to reach the target organism with the toxic material (Barnes, 1977).

The U. S. Army Environmental Agency, Regional Division-West, Fitzsimmons Army Medical Center-Denver, Colorado conducted efficacy tests on 10 percent carbaryl dust in controlling fleas in beechey ground squirrel burrows at Fort Hunter Liggett. The unpublished data indicates that carbaryl will effectively suppress flea population for approximately six weeks (Johnston, 1977).

The following material has been excerpted from Plague, 1976: A Summary of Cases and Epizootic Events in the United States. Plague Branch Vector-Borne Diseases Division, Department of Health, Education and Welfare, Public Health Service Center for Disease Control, Fort Collins, Colorado.

During 1976, 16 human bubonic plague cases were confirmed from the United States. All were associated with wild rodent or rabbit sources of infection stemming from widespread epizootics in previously identified plague foci in the western states. Of the 16, 4 occurred in Arizona, 2 in California, 1 in Colorado, and 9 in New Mexico, a distributional pattern typical of the past 10 years. Three cases were fatal (1 in California and 2 in New Mexico).

Five cases, including the three fatalities, developed secondary plague pneumonia resulting in the need for identification and prophylaxis of 203 case contacts. Two suspect cases later ruled out as plague resulted in treatment of an additional 155 contacts before the cause of illness was determined not to be plague.

The development of secondary plague pneumonitis among plague cases of wild rodent origin has been relatively rare until the last two years. From 1903 through 1974, 144 cases of sylvatic plague were reported in the United States. Sufficient clinical and epidemiological information was available in 117 of these cases to determine that only five (4 percent) developed evidence of pneumonia. In 1975, 3 of 20 cases (15 percent) developed secondary pneumonia, and 5 (31 percent) developed pneumonia in 1976.

Of the 16 human cases in 1976, all occurred within the geographic distribution of <u>Diamanu</u> <u>montanus</u> and one or more of its usual hosts. Devastation epizootics were widespread among other rodent-flea complexes over a much greater geographic area than those in which human cases occurred.

Insecticidal control measures against flea vectors were undertaken in a number of areas in Arizona, California, Colorado, Nevada, and New Mexico, where plague epizootics occurred in close proximity to human habitations and in heavily used recreation areas. Carbaryl (Sevin^R), 5 or 10 percent dust, licensed and registered for use against wild rodent fleas by EPA, was used extensively by state and federal agencies.

Grazing

Each of the three military reservations has an outlease grazing program as an element of the natural resource conservation program. Fort Ord has one sheep lease and one apiary lease; Fort Hunter Liggett has four cattle leases and Camp Roberts has 2 sheep and one cattle leases. Present leases were issued in 1975 and 1976 as summarized in Table 10. Figures 6, 8 and 10 indicate the lease areas on each of the three installations.

Each lease is operated under land use regulations (see Appendix E for an example) which are intended to:

1. Provide for the multiple purpose use of these lands for military purposes, grazing by domestic livestock, public recreation, water conservation and wildlife habitat.

Table 10

STATUS OF GRAZING LEASES ON FORTS ORD AND HUNTER LIGGETT AND CAMP ROBERTS

Installation	AUMs[1]	Area	Lease Number	Lessee	Acreage	Term	Amount
Fort Hunter Liggett	(1,600)	A	DACH05-1-77-507	Joe Paesano	7,150	11/1/76 - 10/31/81	$25,000
Fort Hunter Liggett	(45,000)	B	DACH05-1-76-512	La Panza Cattle Company	86,000	11/1/75 - 10/31/80	$315,000
Fort Hunter Liggett	(1,500)	C	DACH05-1-77-508	Joe Paesano	4,420	11/1/76 - 10/31/80	$18,253
Fort Hunter Liggett	(2,500)	D	DACH05-1-77-509	Joe Paesano	8,820	11/1/76 - 10/31/79	$24,502
Fort Ord			DACH05-1-74-559	Mouren Farming[2]	6,031	12/14/73 - 9/13/78	$17,415
Fort Ord			DACH05-1-75-694	Heinz Michels[3]	1	3/17/75 - 8/16/79	$340
Camp Roberts	(2,000)	A	DACH05-1-77-510	Jaureguy and Mouren	5,854	11/1/76 - 10/31/81	$47,101
Camp Roberts	(3,500)	B	DACH05-1-74-517	Zubeldia[2]	9,146	10/1/73 - 9/30/78	$47,073
Camp Roberts	(5,400)	C	DACH05-1-74-518	Zubeldia[2]	22,091	10/1/73 - 9/30/78	$60,849

[1] Animal Unit Month (AUM) = One (1) Animal Unit grazing for an entire month. Animal Unit (AU) = Five (5) ewes with lamb, or rams or weaned lambs or older sheep; one (1) horse; one (1) cow, heifer, steer or bull; one (1) weaned calf.

[2] Sheep grazing lease.

[3] Apiary lease (1-acre - 2½ acre-parcels).

Source: Sacramento District, U. S. Army Corps of Engineers.

2. Protect the ecological balance to ensure the continued productivity of the land while permitting economic returns to the lessee.

Fort Hunter Liggett

The Army acquired Hunter Liggett Military Reservation in 1941, and the original area was outleased in 1942 to three different parties. No management plan or conservation practices were stipulated. Subsequent leases in 1954 incorporated conservation and range management practices that were designed to improve rangelands along with proper utilization following multiple use concepts.

Four areas are under cattle leases at present. Area A, comprised of 7,150 acres, is limited to 1,600 Animal Units Per Month (AUM); Area B has 86,000 acres limited to 45,000 AUMs; Area C has 4,420 acres limited to 1,500 AUMs; and Area D has 8,820 acres limited to 2,500 AUMs. Table 10 indicates the four lease areas. Because of the present drought and consequent low-range productivity, the cattle stocking at the present time (December 1976) on Fort Hunter Liggett is approximately one third of that authorized under the leases (Wheeler, pers. comm.).

Extensive fencing is not used because of the nature of military operations. Herding and salt locations are used to distribute livestock.

Water is provided by springs, wells and dams, which with intermittent streams provide a good distribution of water throughout the leased areas during late fall, winter and early spring seasons. During late spring, summer and early fall, the water supply is reduced to water taken from springs, wells, some dams and scattered potholes along the Nacimiento and San Antonio streambeds.

Monthly and yearly rainfall totals are extremely variable, from 7 inches in 1966 to 40 inches in 1969. The average annual rainfall for the grazing areas is 15 inches.

Range evaluations have been made at Fort Hunter Liggett since 1953, when the U. S. Soil Conservation Service conducted a soil and range survey. In their June 30, 1953 report, the statement was made that:

> The range over much of the Reservation is in good condition indicating that management has been good. However, we found some overgrazed, eroded and fair to poor condition areas. One of the most damaging factors found on the range was the teeming population of squirrels. The squirrels have denuded quite a few areas and unless checked, will harm more areas and lessen production of the forage on the entire range.

A number of range management suggestions were made, including fertilizing, controlled burning, fencing, leaving vegetation on ground at end of grazing period and moderate grazing to bring about most desirable forb/grass mixture.

Subsequent range evaluations have been made since 1953, and reports are briefly summarized as follows:

J. D. Dillard, in January 1971, indicates that range management appears to be good, but that parts of the area are losing density due to failure of proper use by livestock, which otherwise are expected to scatter seed and trample it underground where it can grow.

Dr. H. H. Biswell, in October and December 1971, indicated that the blue oak woodland-grass ranges were generally moderately utilized. He suggests burning mixed chamise and chaparral to encourage deer. He estimates that the entire reservation may support 54,000 to 60,000 AUMs, with possible supplemental feeding November 15 to February 15. He states that the reservation (October 1971) is considerably overstocked. Range condition for most of the reservation is good; however, could be over-utilized by February.

In December the same areas were looked at by Biswell. Precipitation had been light and weather cold. Biswell states that there was little plant growth, that cattle are in weak condition, obviously not getting enough to eat and recommended 20 pounds per day per head of good quality hay to hold animals in feeding area and prevent excessive soil trampling. He estimates carrying capacity will be 30,000 to 40,000 AUMs because of late rains, cold weather and close grazing.

In January 1973 Dr. A. S. Leopold reported in a letter to General Moore that the Hunter Liggett Reservation rangelands were severely overgrazed and that this depleted range could not support much wildlife.

In March 1973 Dr. William M. Longhurst discussed a number of range management possibilities on Hunter Liggett. These included fertilization, brush management (herbicides, burning) and reseeding. His opinion was that cattle and deer do not have severe competition on this type of range. "Cattle would have to be stocked extremely heavily, virtually to the point of starvation, before significant detrimental effects would be produced on the deer population." He states that deer and quail are benefited by moderate cattle grazing, which tends to promote species of grasses and herbaceous plants at lower successional levels. These species, such as filaree, are preferred.

He also states that doves thrive best when grassland is held at a low successional stage through moderately heavy livestock grazing. The degree of grazing needed to support turkey mullein, however, would not be favorable for cattle or other wildlife. Turkey mullein abundance is down, possibly because of increased levels of cattle grazing.

In November 1973 M. C. Stroud gave a speech concerning the management and utilization of natural resources on the Hunter Liggett range in which he discussed grazing and land use and management studies, but did not mention ground squirrels as a problem.

In January 1975 the Department of Fish and Game sent a letter to Major General Ross, Commanding General, Fort Ord to call his attention to "a grazing problem that has a deleterious impact on the wildlife resource at the Hunter Liggett Military Reservation". The letter pointed out that the relatively level bottom lands appeared to be where the problem was most serious, and a map was included showing areas where excessive grazing was observed.

The Department pointed out that competition between livestock and wildlife comes about in several ways, such as:

1. Heavy livestock use of browse (woody shrubs) diminishes availability of this food for deer.

2. Cattle using most of the available acorns which are a valuable food adjunct to many wildlife species.

3. Nearly complete removal of dry herbaceous vegetation, which eliminates escape areas and food for many small bird and mammal species. Extirpation of smaller species can be anticipated as long as this excessive grazing condition prevails.

The Department goes on to suggest that range surveys and the use of plots and transects can give sufficient information to provide a valid basis to determine range use by the time the grazing lease expires in October 1975.

The Department offered the assistance of personnel in setting up such a range survey and establishing a range management plan, and refers to the very fine program Fort Ord has carried out to permit public utilization of natural resources.

In May 1976 Dr. John Menke prepared a range report in which he indicated that the grassland and woodland grass range types had sufficient live ground cover to prevent raindrop soil compaction and surface erosion. However, with some exceptions, standing-dead herbaceous plant residues, litter and mulch were in very short supply. These factors indicate heavy utilization of forage but not soil degradation.

Dr. Menke predicted unavoidable local overutilization during the summer and fall of 1976 on the grassland and woodland-grass range types, based upon the April livestock stocking rate, the planned reduction in livestock numbers and the low rainfall. He further states that local over-utilization and loss of ground cover will occur seasonally, generally on nearly level land, pointing out that riparian habitats may suffer some degradation in the process if not managed carefully.

Menke reports that the species composition of the grass-land ranges were not significantly different than that of a moderately grazed annual rangeland. Filaree (*Erodium* spp.) and brome grasses (*Bromus* spp.) dominate the open grasslands while wild oat (*Avena* spp.) is more abundant on steeper slopes and areas less susceptible to livestock.

Livestock grazing has affected the species composition by reducing taller grasses and promoting lower prostrate forbs such as filaree, trefoil and bur clover. Wildlife (especially quail and deer) prefer these forbs, which are more nutritious than grasses.

Yellow-star thistle and tarweed have infested some areas. Except for these weedy sites, the mixture of annual grasses and annual forbs was considered to be acceptable and desirable for sustained production of wildlife and livestock grazing.

The plant production, however, is highly dependent upon rainfall and other factors.

Ground squirrels have removed a significant ground surface area from production and consume a significant amount of forage that could be more productively consumed by other wildlife and livestock.

Ground squirrels may be associated with both nonutilized as well as heavily utilized land, and at Hunter Liggett are certainly associated with heavy utilization by livestock.

Menke points out that with reduction in forage utilization and reduction in squirrel numbers, more net forage would be available for livestock grazing in a few years, thus the same number of livestock could be supported with a lower utilization.

Menke also refers to Dr. Harold Heady who has pointed out (Heady, 1975) that the amount of herbaceous plant residue (mulch) at the end of the grazing season may be related to plant productivity, and that approximately 500 pounds/acre seems to be optimal for sustained yield. Quantitative measure-ments should be instituted to monitor utilization.

Based upon qualitative inspection, Menke rates the Fort Hunter Liggett general range conditions as fair on a scale of poor, fair, good and excellent.

The Sacramento district Corps of Engineers has awarded a contract for the preparation of a range and related resource inventory and condition report with management recommendations for Fort Hunter Liggett.

The study will include detailed information on soil and vegetation types, range condition and trend, carrying capacities for wild and domestic animals and recommendations for range improvement practices. Additional information on threatened and endangered species, both plant and animal, and critical habitats will be included.

The study will also report on:

1. Average annual carrying capacities for each of the range types for domestic livestock in terms of animal unit months as defined in the existing outlease documents. The carrying capacities should reflect the maximum stocking rates possible without inducing damage to the range or related resources (i.e., wildlife, soils, etc.). Summations of carrying capacities for range types shall be made for each of the existing grazing outlease areas as well as for those areas (primarily brushlands) not presently outleased for grazing.

2. Recommended grazing strategies for each of the existing outleased areas, including seasonal variation of actual stocking rates and distribution of livestock. These recommendations will be based on existing range improvements and controls, such as present locations of fences and water developments.

3. Suggested range improvements for each area, such as cross-fencing, rehabilitation and/or development of watering facilities, salt distribution, range type conversion through burning and reseeding, fertilization, range rodent and wood control, etc. Along with each recommendation shall be included a cost analysis and resulting change in grazing strategy for the area.

Fort Ord

One sheep lease for 6,031 acres at a stocking rate of 13,500 AUMs is in effect at Fort Ord. The carrying capacity at Fort Ord was established by range management personnel employed by the Fort Ord complex and the district engineers office, Corps of Engineers (Wheeler, pers. comm.).

Camp Roberts

One cattle lease for 5,854 acres at a stocking rate of 13,500 AUMs and two sheep leases -- one for 9,146 acres and 3,500 AUMs, the other for 22,091 acres and 5,400 AUMs are in effect at Camp Roberts. The carrying capacity at Camp Roberts was established by range management personnel employed by the Fort Ord complex and the district engineers office (Wheeler, pers. comm.).

Field Observations -- November 8-19, 1976
by Jones & Stokes Associates, Inc.

Jones & Stokes Associates, Inc. personnel traveled over some of the rangelands of Forts Ord and Hunter Liggett and Camp Roberts and made several observations concerning range appearance.

Generally, grazing on Fort Ord appeared to be of medium intensity and grass was being maintained. Some undesirable species such as Medusa head (*Elymus capert medusa*) are invading, probably due to seed introduction.

Grazing on Fort Hunter Liggett and Camp Roberts appeared to be very intense. There was a great reduction of dry litter on the area's surface in the dry season.

There was no observed evidence of erosion related to grazing on any of these areas.

LAND USE RELATIONSHIPS

LEGAL, POLICY AND INSTITUTIONAL CONSTRAINTS

This section provides a checklist of laws and regulations of various governmental agencies that have either regulatory or planning responsibility that affects the planning and implementation of the proposed ground squirrel control program -- either directly or indirectly. It describes those land use plans, policies and controls which may act as constraints at the federal, state or local level. Any conflicts or inconsistencies between these and the proposed action will be addressed in the Proposed Action and Alternatives-Impacts and Mitigation section.

Federal installations and federal activities are generally not subject to non-federal laws and regulations. The state and local laws and regulations listed in this section do not apply to the federal government, and the proposed activity is not subject to their provisions. However, the federal decision makers will fully consider these local laws and regulations insofar as they provide sound environmental policy and standards.

Environmental Requirements

National Environmental Policy Act

The National Environmental Policy Act of 1969 (NEPA) establishes policy regarding environmental quality. NEPA directs that proposals for major federal actions that significantly affect the quality of the environment include a a detailed statement on the environmental impact of the proposed action. Alternatives to the proposed action must be circulated for comment to other federal agencies, to state and local governments and to the public.

Council on Environmental Quality NEPA Guidelines

The Council on Environmental Quality (CEQ) is responsible for coordinating the development of the impact statement process. Their published guidelines apply to the obligation of all federal agencies under section 102(2)(c) of NEPA. Under these guidelines each federal agency is required to adopt procedures for the implementation of the Act and the CEQ guidelines.

Department of Defense Directive and Army Regulations

Department of Defense Directive 5100.50 and Army Regulation 200-1 together with the Department of Army Pamphlet 200-1 -- Handbook for Environmental Impact Analysis -- are the military's procedures for implementing the CEQ's guidelines.

California Environmental Quality Act (CEQA)

The CEQA requires the preparation of environmental impact reports by public agencies on any project they propose to carry out or approve which may have a significant effect on the environment. The California Resources Agency is responsible for the preparation and issuance of regulations to implement the Act.

Land Use Constraints

Certain Federal legislation and regulations provide direction and guidance to the management of military lands.

Sikes Act - Public Law 86-797 (1960)

This act authorizes the Secretary of Defense to carry out a program of planning, development, maintenance and coordination of wildlife, fish and game conservation and rehabilitation in military reservations in accordance with a cooperative plan mutually agreed upon by the Secretary of Defense, Interior and the appropriate state agency.

Department of Defense Directive #5500-5 (1965)

This directive prescribes DOD policies and establishes an integrated multiple-use program for renewable natural resources in forests, woodlands, fish and wildlife, soil, water, grasslands, outdoor recreation and natural beauty. This directive references DOD directive 5154.12 which establishes an Armed Forces Pest Control Board which functions as the coordinating activity in the DOD for pest control and is the principal advisory board to all DOD agencies and activities on all matters relating to pesticide use, including those pertaining to the problems of resource conservation and management.

Natural Resources - Land, Forest and Wildlife Management AR 420-74

This regulation establishes natural resource management objectives and principles, requires the preparation of various land and resource management plans, and requires the preparation of annual natural resources reports for each installation.

Cooperative Agreement for the Conservation and Development of Fish and Wildlife for the Fort Ord Complex consisting of Fort Ord, Camp Roberts and Hunter Liggett Military Reservation, California. (May, 1963)

This agreement between the California Department of Fish and Game, the U.S. Fish and Wildlife Service and the Commanding General, Fort Ord was consummated to carry out the Sikes Act and to implement the directive and regulations indicated above.

American Antiquities Act of 1906

This act provides for the protection of historic and prehistoric ruins, monuments, or objects of antiquity on federal land.

National Historic Preservation Act of 1966

This act provides for a National Register of Historic Places. It is the basis for Executive Order No. 11593.

Executive Order No. 11593

This Executive Order directs federal agencies to ensure the preservation of cultural resources on federal ownership.

Endangered Species

Federal Endangered Species Act of 1973, PL 93-205

Section 7 of the Endangered Species Act directs that all Federal agencies shall utilize their authorities in furthering the purposes of the act, shall not authorize, fund, or carry out actions that will result in jeopardizing the continued existence of listed species or action which will result in the destruction or adverse modification of the habitats of listed species.

California Endangered Species Act of 1970

The California Endangered Species Act of 1970 gives authority to the Fish and Game Commission to declare birds, mammals, fish, reptiles, and amphibians as endangered or rare and to prohibit with limited exceptions and importation, taking, possession and sale of rare and endangered wildlife.

Pest Control

California Authority

Basic authority for pest control in California is vested in the Department of Food and Agriculture through various sections of the California Agriculture Code. The County Agricultural Commissioners act as enforcing officers of pest control laws and regulations and generally direct the pest control programs. Relevant agriculture code sections are:

Section 403: The Department shall prevent the introduction and spread of injurious insect or animal pest, plant diseases, and noxious weeds.

Section 482: The Director may enter into cooperative agreements with individuals, associations, boards of supervisors, and with departments, bureaus, boards, or commissions of this state or of the United States for the purposes of eradicating, controlling or destroying any infectious disease or pest within this state. He may enter into cooperative agreements with boards of supervisors for the purpose of administering and enforcing this code.

Section 5101: Each commissioner is an enforcing officer of all laws and regulations which relate to the prevention of the introduction into, or the spread within the state of pests. He is, as to such activities, under the supervision of the Director.

Section 6021: If the director receives a report from the State Director of Public Health which states that field rodents in a certain area carry, or are likely to carry, any disease, insect, or other vector of any disease which is transmissible and injurious to humans, he shall forthwith advise the commissioner of the county in which such rodents exist.

Section 6022: The commissioner shall cooperate in suppressing field rodents and insects, or other associated vectors of rodent-borne diseases transmissible and injurious to humans.

Section 6023: The director shall cooperate by entering into an agreement pursuant to Section 482 for the purpose of suppressing the field rodents and insects or other associated vectors in the reported areas and in neighboring areas, to prevent the spread of the rodents and insects, or other associated vectors.

Section 6024: In order to carry out the purposes of this article, the director or commissioner may enter upon any and all premises within any reported areas or neighboring area to bait, trap, expose chemically treated baits, or perform any act which he deems necessary for the purpose of suppressing, destroying, or repelling the rodents and insects, or other associated vectors.

California government code section 25842 provides that County Boards of Supervisors may provide for the control or destruction of gophers, squirrels or other wild animals.

Several sections in the California Fish and Game Code and Title 14 of the Administrative Code address the subject of pest control. Extracts of relevant sections follow.

* Section 4152: Taking Nongame Mammals, Jackrabbits, Muskrats, and Red Fox Squirrels. Nongame mammals and black-tailed jackrabbits, muskrats, and red fox squirrels which are found to be injuring growing crops or other property may be taken at any time or in any manner by the owner or tenant of the premises or employees thereof, except that if leg-hold steel-jawed traps are used to take such mammals, the traps and the use thereof shall be in accordance with the provisions of subdivisions (a) and (b) of Section 4004. They may also be taken by officers or employees of the California Department of Food and Agriculture or by federal, or county officers or employees when acting in their official capacities pursuant to the provisions of the Food and Agricultural Code pertaining to pests, or pursuant to the provisions of Article 6 (commencing with Section 6021) of Chapter 9 of Part 1 of Division 4 of the Food and Agricultural Code. Persons taking mammals in accordance with this section are exempt from the requirements of Section 3007. (Exempt from requiring a hunting license or permit.)

Section 3005: Taking by Poisons. It is unlawful to take birds or mammals with any net, pound, cage, trap, set line or wire, or poisonous substance, or to possess birds or mammals so taken, whether taken within or without this State.

Proof of possession of any bird or mammal which does not show evidence of having been taken by means other than a net, pound, cage, trap, set line or wire, or poisonous substance, is prima facie evidence that the birds or mammals were taken in violation of the provisions of this section.

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* Note: The ground squirrel is a non-game mammal.

This section does not apply to the lawful taking of fur-bearing mammals, nongame birds, nongame mammals, or mammals found to be injuring crops or property, nor to the taking of birds or mammals under depredation permits, nor to the taking by employees of the Department acting in official capacity or holders of a scientific or propagation permit acting in accordance with the conditions of the permit.

Policy Statement - Rare and Endangered Species - California Department of Food and Agriculture, Fish and Game and the California Agricultural Commissioner's Association

The 1976 joint policy statement recognizes there may be hazards with certain applications of toxicants for the control of vertebrate pest animals in specific areas inhabited by rare and endangered species.

The policy provides that each county or the state's proposed vertebrate pest animal control program within the range of rare or endangered species shall be reviewed annually by the Department of Fish and Game to ascertain the threat to any of these species. The Department will identify any problems to rare and endangered species and so advise the Department of Food and Agriculture and the agricultural commissioners of the affected counties.

Use and Control of Pesticides

Federal

General. In 1947 the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) was enacted. Its primary objective was to license pesticides to regulate interstate shipment. This act was amended by the Federal Environmental Pesticide Control Act of 1972, (FEPCA) which is administered by EPA. It requires federal registration by EPA, with only a few exceptions, for all pesticides used in the United States. The Act establishes registration and permit procedure, classifies pesticides, provides for the certification of applicators to apply restricted use pesticides and provides for supervision, cancellation, indemnification and judicial review.

The effective dates of provisions of the act vary, based on the 1972 act and amendments since that time. The final date for re-registration of previously registered pesticides (i.e., by states) has been extended to October 1977 due to the 1975 amendments of the act.

Rebuttable Presumption List. Compound 1080 has not yet been registered by EPA for ground squirrel control although state registration exists. Compound 1080, 1081 and strychnine were placed by EPA on their rebuttable presumption list based on EPA regulations (40 CFR 162). Section 162.11 provides that a rebuttable presumption against registration shall arise if it is determined that a pesticide meets or exceeds any of the criteria for risks set forth in 162.11(a)(3).

Rebuttable Presumption Notice. On December 1, 1976 EPA filed notice in the Federal Register (Vol. 41, No. 232) indicating that a rebuttable presumption against registration of all pesticide products containing strychnine, strychnine sulphate or compounds 1080 and 1081 does exist. Under these regulations, all registrants and applicants for registration are notified and given 45 days to submit evidence in rebuttal of the presumptions listed which indicate the strychnine products or compound 1080 and 1081 meet or exceed the risk criteria set forth in 40 CFR 162.11(a)(3). All information, including public comments, will be considered by EPA before it is determined whether a notice shall be issued in accordance with 40 CFR 162.11(a)(5)(ii).

The risk criteria referenced in the rebuttable presumption notice are as follows.

A. Acute Toxicity. Hazard to wildlife Sections 162.11(a)(3)(i)(B)(1) and (2) provide that a rebuttable presumption shall be issued if the pesticide as formulated occurs as a residue immediately following application in or on the feed of a mammalian or avian species representative of species likely to be exposed to such feed in amounts equivalent to the average daily intake, at levels equal to or greater than (1) the acute oral LD_{50} for mammalian species and (2) the subacute dietary LC_{50} for avian species.

B. Effects on Nontarget Organisms. 40 CFR 162.11(a)(3)(ii)(C) provides: "A rebuttable presumption shall arise if a pesticide's ingredient(s) * * * [c]an reasonably be anticipated to result in significant local, regional or national population reductions in nontarget organisms, or fatality to members of endangered species".

C. Lack of Emergency Treatment. 40 CFR 162.11(a)(3)(iii) provides: "A rebuttable presumption shall arise if a pesticide's ingredient(s) * * * [h]as no known antidotal, palliative, or first aid treatment for amelioration of toxic effects in man resulting from a single exposure".

(The EPA evidence which supports its position that these risk criteria have been exceeded is provided in the Proposed Action and Alternatives-Impacts and Mitigations section.

Exemptions of Federal and State Agencies

FIFRA as amended provides for certain exemptions by federal and state agencies when an emergency exists. The two types of exemptions that are relevant are the "specific exemption" and the "crisis exemption".

An emergency will be deemed to exist when (a) a pest outbreak exists or is about to occur and no registered pesticide or alternate method of control is available to eradicate or control the pest, (b) significant economic or health problems will occur without the use of pesticide, and (c) the time available from discovery or prediction of the pest outbreak is insufficient for registration of pesticide. Permits will be granted for specific exemption, quarantine-public health exemption and crisis exemption.

Exemptions shall be applied for in writing by the head of the federal agency or governor of the state involved, to the EPA administrator. Applications shall include a list of the pesticides proposed for use, whether a registered pesticide is available for the proposed use, the scope and nature of the situation demanding exemption, description of the proposed pest control or public health program, and statements of possible effects on man and the environment. If an EIS has been prepared, it should be submitted.

When a specific exemption has been approved, the agency involved shall immediately inform the EPA of the time and place of pesticide application; record quantity, location and extent of use of pesticide, and inform EPA within 10 days of end of application; monitor effects as required by EPA and report results; provide a summary report within 1 year.

When a federal or state agency uses a crisis exemption, the agency head or state governor shall notify the EPA by telegram within 36 hours after the pesticide has been used. Within 10 days, a written report shall be filed with EPA stating nature and scope or emergency; pest involved; unavailability of appropriate registered pesticide; critical nature of time element which did not allow request for specific or quarantine-public health exemption; application information (location, quantity, method, duration, personnel); steps being taken to reduce possible adverse effects on man and environment. If crisis treatment is expected to last more than 15 days total, the report should be accompanied by a specific exemption application.

On 13 August 1976, Fort Ord, U.S. Army notified EPA of a crisis exemption declaration to control plague vector fleas. The notification stated:

On 11 August 1976, Fort Ord, U. S. Army, exercised crisis exemption under Section 18 under the Federal Insecticide, fungicide and Rodenticide Act as amended because of an imminent plague hazard which required that Carbaryl be evaluated to control plague vector fleas.

Three hundred (300) pounds of Carbaryl Dust, 10 percent, EPA Registration #7001-179-AA, EPA Establishment #7001-CA-1, Occidental Chemical Company, was applied to control plague vector fleas on approximately 20 acres at Fort Hunter Liggett, California, because a registered 10 percent Carbaryl Dust product was not readily available. Approximately 2 ounces of Carbaryl Dust was placed into each California Ground Squirrel (Spermophilus Beecheyi) burrow.

The time element prohibited Fort Ord from requesting a specific exemption or waiting until a registered product could be shipped from Thompson-Hayward Chemical Company in New Orleans, Louisiana.

Executive Order Regarding Federal Lands. On February 9, 1972, the President issued Executive Order 11643, titled Environmental Safeguards on Activities for Animal Damage Control on Federal Lands. This order was rewritten and issued by the President July 18, 1975 as Executive Order 11870. The order was further revised by Executive Order 11917, May 28, 1976. The order prevents on federal lands "field use of any chemical toxicant for the purpose of killing predators, and the field use of any chemical toxicant which causes any secondary poisoning for the purpose of killing mammals, birds, or reptiles".

Section 3b of Executive Order 11870 states:

> Notwithstanding the provisions of Subsection (a) of this section, the head of any agency may authorize the emergency use on Federal Lands under his jurisdiction of a chemical toxicant for the purpose of killing other mammals, birds, or reptiles, but only if in each specific case he makes a written finding, following consultation with the Secretaries of the Interior, Agriculture, and Health, Education and Welfare, and the administrator of the Environmental Protection Agency, that an emergency exists that cannot be dealt with by means which do not involve use of chemical toxicants, and that such use is essential.

On 17 August 1976 the Army held a meeting under Section 3b with the Departments of Agriculture, Interior, HEW, EPA, and the Council on Environmental Quality on the threat to human health associated with large populations of ground squirrels on military installations in the State of California and to determine measures necessary to mitigate the threat of human infection from plague. Excerpts from the Army Memorandum of Record (August 19, 1976) state:

The objective of the meeting was to present evidence that a threat to human health exists and to solicit the opinions of the agencies represented as to whether we have a basis to seek exception to the Executive Order for the use of a toxicant having secondary effects for rodent control.

Significant points from the meeting are:

1. The Surgeon General's Office presented the rationale for the Army Surgeon General's determination that a threat to human health exists (Incl 2). The factors contributing to this determination are: a highly abundant, plague-susceptible host species (Spermophilus beecheyi); high flea counts on the rodent hosts; a marked increase this year in the occurrence of epizootic plague and human cases throughout the Western states, including California; and evidence by carnivore serology of the existence of plague foci at the Fort Ord complex or in the vicinity. The California State Department of Health and the DHEW agreed with TSG's appraisal of the existence of a serious threat to human health.

2. Walter Reed Army Institute of Research presented data on the incidence of human plague in the Western United States from 1920-1976 (Incl 3). These data show that the overall incidence of plague cases has increased in recent years in the U.S., and suggest that the problem is a great deal broader in scope, involving other Federal lands in the West, than the immediate problem at Fort Ord.

3. Letterman Army Institute of Research presented findings on the prevalence of rodents and fleas at Fort Ord, and on research studies being conducted at Fort Ord on flea and rodent control measures (Incl 4). The data indicate that, in areas of human habitation, carbaryl for flea control and diphacinone for rodent control are adequate. For large scale controls (i.e., in open range areas) the materials of choice would appear to be carbaryl and 1080. The data on carbaryl are preliminary; however, studies just initiated with this compound show good flea control in 48 hours. If carbaryl is shown to have persistent effects, carbaryl will be the insecticide of choice. Controls will be required on a continuing basis. Rodenticide 1080 can be applied annually to achieve adequate results. Other rodenticides would require more frequent application, and are not amenable to aerial dispersal. The DHEW indicated that continuing evaluations of the effects of control measures would be warranted.

4. Flea and rodent control will be initiated in areas of human habitation, using carbaryl and diphacinone. An environmental assessment of this operation will be made and publicized.

6. Department of Agriculture, Interior, HEW, EPA and CEQ will present their written opinions within two weeks as to whether we have due cause to seek exception to Executive Order 11870 for use of a secondary effects toxicant fc rodent control for reason of protection of health and safety of human life.

7. Based on the opinions and recommendations received (6 above), a plan for control and an EIS will be prepared for actions required for eradication on open range land. All feasible alternatives will be considered in the EIS review process.

8. We can expect to do range controls no sooner than the Spring of 1977, considering the procedural requirements to be met and the fact that squirrels will be hibernating during the winter months, when controls would be of minimal value. The month of September would normally be a time that controls could be expected to be reasonably effective, but it would not be possible to meet the procedural requirements in time for controls to be exercised in this time frame.

Consultation Responses. On September 2, 1976, Mr. Richard Feltner, Assistant Secretary, U. S. Department of Agriculture memo to the Army stated:

This is in response to your August 20 letter about Executive Order 11870 and the use of "1080" (Sodium monofluoroacetate) to control ground squirrel in California because of a likelihood of plague.

Our review of your information on the subject indicates that a threat does now exist to human health. Therefore, this Department concurs that (1) an emergency exists and (2) that an emergency exists which cannot be dealt with by means which do not involve the use of chemical toxicants and that such use is essential according to the provisions of the Executive Order.

Mr. John Ritch, Director, Registration Division, the Environmental Protection Agency (EPA), indicated at the August 17 meeting that EPA has two State "1080" registrations labeled for ground squirrel control in California. If used according to their registered label directions for use, we believe that adverse effects on the environment are not likely to occur.

On August 24, 1976, Mr. Russell W. Peterson, Chairman of the Council of Environmental Quality memo excerpts to the Army stated:

The Council is concerned about the effects of such a proposal and the proper integration of a Section 3(b) determination under the Executive Order with the policies and procedures of the National Environmental Policy Act (NEPA). We are also anxious to insure the best possible coordination of the actions of federal agencies that have jurisdiction and expertise in determining the need for and effects of ground squirrel control measures as that control may be necessary because of the squirrel's infestation with fleas, the potential carriers of bubonic plague.

It appears that, based on the information presented by the office of the Army Surgeon General at a meeting of federal agencies on August 17, 1976, there may be a public health problem requiring an immediate flea control program in certain California military installations. We understand that the Army proposes to take such steps, involving the use of Carbaryl, based on an adequate environmental review that will be widely circulated among the public and other federal, state and local agencies. We hope that after full evaluation of their effectiveness by the Army and other federal agencies these immediate flea control measures will have reduced the public health risks posed by present squirrel and flea populations to acceptable levels.

It is the Council's view, however, that there is no present emergency justification for the use of 1080 or DDT to control fleas and ground squirrel populations in military installations in California. Justification for the use of such chemical toxicants and for the declaration of an emergency under Section 3(b) of the Executive Order can and should be determined only after completion of the environmental impact statement process.

The consultation that has already begun pursuant to Section 3(b) of the Executive Order should be a part of that impact statement process. We recommend to the Department of the Army that in the course of this consultation process it work closely with HEW and the Fish and Wildlife Service of the Department of the Interior in order to determine their respective expertise and responsibilities in helping to prepare the impact statement. It will also be necessary to obtain the expertise and assistance of EPA in order to decide whether any chemical toxicant, such as 1080, might pose more serious threats to public health and the environment than would be posed without control program. The Council is, of course, ready to assist the federal agencies in determining the scope of the impact statement and the individual agency responsibilities for its preparation.

On October 22, 1976, Mr. John Quarles, Deputy Administrator, EPA, for Russell E. Train memo excerpts to the Army stated:

It has been recommended by the Office of Pesticide Programs, and I concur, that I advise the Army to use ground application of the anticoagulant bait diphacinone and zinc phosphide grain for ground squirrel control in areas of human activity, and aerially applied zinc phosphide in remote areas. Zinc phosphide is not currently registered for ground squirrel control. However, the U.S. Department of Interior does have a pending application for zinc phosphide. Certain data must still be submitted but we do not anticipate problems with the submission of the requisite data. Zinc phosphide for ground squirrel control on rangelands should be registered in time for use in a spring program. It is the Agency's position that the Army has amply demonstrated that an emergency health risk exists to warrant a request for an exemption from the Executive Order to allow them to use a chemical toxicant, but it is felt that 1080 (sodium fluoroacetate) should be avoided unless other means of control are shown to be ineffective. In this way, we can take all steps necessary to avoid secondary poisoning and allow the Army to prepare an Environmental Impact Statement for a spring program, if 1080 proves necessary.

A diphacinone and zinc phosphide program is expected to result in reliable reduction of ground squirrels, and to reduce the hazard of an epizootic, and subsequently, a plague threat to humans. Also, since the ground squirrel population will not be completely exterminated, we would advise the continuation of the carbaryl dusting program which has been shown to be effective in destroying the ground squirrel fleas, the carriers of the plague.

In the process of contacting the various State and Federal authorities, including the California Department of Health, the Army Surgeon General, and the Center for Disease Control (CDC), and with the agreed upon recommendation that the ground squirrel population should be reduced by at least 85 percent, one particularly important aspect of the ground squirrel population explosion was noted: the increase appears to have resulted from the overgrazing of the Federal lands involved. This point was particularly stressed by Dr. Allan Barnes of the CDC,* and he urged that the Army take steps to correct this problem. Although this Agency has not fully examined this allegation, we believe it would benefit the Army to examine this possibility in order to avoid future control programs that could possibly result in secondary poisoning to endangered species.

* In a letter of December 2, 1976 to the office of the client engineers, Dr. Barnes wrote that he did not state that the increase of ground squirrels appears to have resulted from overgrazing of the federal lands involved. He wrote that he did state the belief, essentially in agreement with EPA, that the Army would benefit from a consideration of environmental factors found to affect squirrel populations -- negatively or positively in future land use planning.

I am hopeful that this correspondence will aid the Army in determining the methods it will apply to control the ground squirrel population. I would add that any field use of zinc phosphide must be closely monitored by representatives of the California Fish and Game Department, and/or the U.S. Fish and Wildlife Service, to ensure that provisions of the Endangered Species Act are followed and that non-target species are minimally affected. If I may be of any further service, please feel free to contact me.

On September 10, 1976, Mr. David Mathews, Secretary of the U. S. Department of Health, Education and Welfare memo to the Army stated:

Thank you for your letter of August 20 requesting an opinion on the need to seek an exemption to Executive Order in order to use toxicants having secondary effects for the purpose of rodent control on military installations in California.

It is our understanding from the data presented at your meeting on August 17 with Department representatives that the potential for the occurrence of bubonic plague exists at the Fort Ord military complex in California. The evidence of a possible health threat included an abundant and susceptible rodent population, a consistently high flea count on rodent hosts, and positive serological findings in carnivores. With this indication of a plague focus in the vicinity of human activity, and the known endemicity of epizootic plague in several Western States, we agree that a potential hazard to human health does exist. The reduction or elimination of such a health hazard is consistent with good preventive health policies.

We, therefore, concur with your findings and support your need to use the appropriate chemical toxicants which will effectively control the flea and rodent populations. We feel assured that toxicants will be used with concern for human safety and the vested interests of all State and Federal agencies.

On September 9, 1976, Mr. Nathaniel Reed, Assistant Secretary for Fish and Wildlife and Parks, U. S. Department of Interior memo excerpt to the Army stated:

Determination of an "emergency" in this instance appears to rest within the sphere of expertise of public health authorities, epidemiologists, or physicians, and is therefore beyond the scope of professional knowledge in this Department. However, there may be some question as to the immediacy of the emergency since the Memorandum of Record attached to your August 20 letter indicates that broadcast application of 1080 rodenticide is not anticipated before spring of 1977. While this delay is attributed to procedural requirements occasioned by restrictions on the toxicant of choice,

1080, by provisions of Executive Order 11917, it seems inconsistent with an "emergency" situation to delay several months when another rodenticide, zinc phosphide, may be available for immediate use. Zinc phosphide to our knowledge does not have secondary poisoning characteristics and its use would therefore not be prohibited as a field rodenticide by the Executive Order.

It should also be noted that as prerequisite to implementing the emergency provisions of Section 3(b) of the Executive Order, consideration must be given to Section 1(5) which states as the policy of the Federal Government to "assure that where chemical toxicants or devices are used pursuant to Section 3(b), only those combinations of toxicants and techniques will be used which best serve human health and safety and which minimize the use of toxicants and best protect nontarget wildlife species and those individual predatory animals and birds which do not cause damage..." (emphasis added). The choice of 1080 as the preferred rodenticide in this circumstance should be weighed carefully against the policy stated in Section 1(5) of the Executive Order.

Again referring to the Memorandum of Record attached to your August 20 letter, it is inferred therein that annual use of rodenticide 1080 is contemplated. Before this practice is adopted as a permanent procedure, a better understanding is needed of the dynamics of the ground squirrel population at the Fort Ord complex. Numerous studies of ground squirrels and other range rodent populations suggest that a number of environmental factors other than the absence of toxicant control are responsible for population eruptions or unusually high population densities sustained over a period of time. By identifying these factors, it is possible to develop management plans which are cost effective and environmentally safe with minimal need for toxicant use or other control techniques. I recommend that appropriate studies be conducted to determine what these management plans should be.

U. S. Department of Interior guidelines for use of poisons in Nonpredatory Animal Damage Control (May 23, 1972).

The purpose of this guideline is to specify chemicals permitted and conditions under which they may be used when controlling damage caused by nonpredatory mammals, birds and reptiles on Interior Department lands or in programs under Interior Department jurisdiction in compliance with Executive Order No. 11643.

The stated policy of Executive Order No. 11643, "Environmental Safeguards on Activities for Animal Damage Control on Federal Lands," provides specific restrictions on the use "...of chemical toxicants which cause any secondary poisoning effects for the purpose of killing... mammals, birds, or reptiles...." Further, the policy clearly states that all mammal and bird damage control programs "...shall be conducted in a manner which contributes to the maintenance of environmental quality, and to the conservation and protection, to the greatest degree possible, of the Nation's wildlife resource...."

Secondary Poisoning Effect Resulting From Field Use

By Executive Order definition, a "secondary poisoning effect" occurs when a chemical toxicant is retained in a target animal in such a manner and quantity that its chemical action will cause significant bodily malfunction, injury, illness or death to non-target animals or to man when the body part retaining the chemical in question is ingested.

It is clear that the degree of toxicity of a chemical varies in accordance with its respective chemical and physical properties and with the amount and manner of its use. The degree of secondary poisoning effect caused by such toxicants will vary similarly. It is evident that some toxicants will have a "secondary poisoning effect" only as a result of gross application and consequent accumulation in the target species. Accordingly, if these toxicants are not used in such gross amounts, it is permissible to use them for the control of non-predatory, depredating mammals and birds. Thus, it is within the intent of Executive Order No. 11643 that determination of a "secondary poisoning effect" must allow for consideration of amounts and methods of actual field use as well as the toxicological properties of the chemicals in question (CF, 50 Am. Jr. Statutes, 378, 382).

In summary, toxicants which have a theoretical secondary poisoning effect may be used if, in practical application, toxic concentration, bait materials, and methods of application are so controlled as to prevent adverse secondary effects to man and non-target populations.

Authorization Procedure

Since this interpretation of Executive Order No. 11643 relies heavily upon applying practical secondary poisoning effect data to field situations, it is necessary to consider use of permitted toxicants in the light of specific patterns of use and to base decisions for using these materials on sound ecological knowledge of specific habitats. Standard dose-weight pharmacology toxicity estimates should be considered as they relate to the target organism as well as to carrion feeders that can be expected to share its habitat. Since secondary poisoning hazard will vary with specific field conditions, agency directors will be responsible for assuring that adverse secondary effects to man and non-target populations will not result from field patterns of use, that such uses comply with federal and state pesticide use regulations, and that programs proposing use of chemical toxicants are submitted as appropriate for review and approval by the Federal Working Group on Pest Management.

(This group is no longer in existence. The Regional Pesticides staff specialist of the U. S. Fish and Wildlife Service is now responsible for proposed program reviews on certain federal lands and programs. Military lands are not included in his review responsibility, but his recommendations may be solicited.)

Toxicants Permitted for Non-Predatory Mammal and Bird Control (partial)

Only the following chemical toxicants may be used within the context of these guidelines:

1) Non-predatory mammal control baits -- baits treated with strychnine alkaloid or zinc phosphide may be used for controlling non-predatory mammal damage. Potential for secondary poisoning effects from normal uses of these toxicants are related to remnant amounts of the toxicant not degraded in the gastro-intestinal tract prior to death of the target individual and are not associated with other body parts. Since baits are treated at the lowest concentration effective against target animals, the possibility of secondary poisoning effects" occurring under field conditions is remote. However, if there is reasonable doubt as to secondary poisoning hazard, use will not be made.

3) Burrow fumigants -- These fumigants include cyanide compounds, carbon bisulfide, methyl bromide and chloropicrin. These chemicals are generally considered to have no secondary poisoning effect and since use is restricted to underground situations, the likelihood of contact with carrion feeders is remote.

4) Suffocating cartridges -- These devices, when ignited and inserted into closed burrows, remove available oxygen and result in suffocation of target species. Secondary poisoning effects are not possible under these conditions.

Non-Field Use

The Executive Order restrictions apply only to "field use" of chemical toxicants. "Field use" applies only to controlling damage caused by non-commensal mammals, birds and reptiles. The order does not apply to urban bird and rodent control programs for residential, industrial, and urban facilities, including garbage dumps, communication facilities, etc.; the order does not restrict the type of chemical toxicants that can be used in these situations.

California Authority

The prime authority for control of pesticides in California is vested in the California Department of Food and Agriculture. Various pesticide laws are found in the California Food and Agriculture Code. Rules and regulations are found in Title 3, California Administrative Code.

The various laws and regulations define economic poisons, regulate their manufacture, labelling, and distribution, designate those which are restricted, require permits for their use and establish regulations covering pest control operators, advisors and dealers -- all designed to carefully control the uses of pesticides in California.

The rodenticide sodium monofluoracetate (compound 1080) is a restricted material and a permit is required for its possession and use. Its sale, use and possession is covered in Article 22, Sections 2470-2472 of the California Agriculture Code. Section 2471 controls the sales, records, possession, storage, containers, handling and waste disposal. Section 2472 covers the use for pest control purposes including baits, bait boxes and containers, prohibited uses, indoor and outdoor placement. The rodenticide strychnine and zinc phosphide are also restricted materials and when used for agricultural purposes a permit is required for their use.

Section 6021, Food and Agriculture Code, states:

Report of rodents carrying diseases transmissible to humans. If the director receives a report from the State Director of Public Health which states that field rodents in a certain area carry, or are likely to carry, any disease, insect, or other vector of any disease which is transmissible and injurious to humans, he shall forthwith advise the commissioner of the county in which such rodents exist.

Section 5650, Fish and Game Code, states:

It is unlawful to deposit in, permit to pass into, or place where it can pass into the waters of this State any of the following:

(a) Any petroleum, acid, coal or oil tar, lampblack, aniline, asphalt, bitumen, or residuary product of petroleum, or carbonaceous material or substance.

(b) Any refuse, liquid or solid, from any refinery, gas house, tannery, distillery, chemical works, mill or factory of any kind.

(c) Any sawdust, shavings, slabs, edgings.

(d) Any factory refuse, lime, or slag.

(e) Any cocculus indicus.

(f) Any substance or material deleterious to fish, plant life, or bird life.

Local Regulation and Policy

Monterey County Ordinance. Monterey County Ordinance 328 states:

> An Ordinance to enforce the extermination of ground squirrels in the County of Monterey, State of California, and punish the violation of the same by fine or imprisonment, or both.
>
> The Board of Supervisors of the County of Monterey do ordain as follows:
>
> Section 1. Every person, firm or corporation, owning, leasing, possessing or occupying any land in the County of Monterey, State of California, in and upon which there are any ground squirrels, shall, upon the discovery or knowledge of such presence of ground squirrels, immediately proceed in good faith to endeavor to exterminate, kill and destroy the same by placing, spreading and distributing poisoned grain upon said lands to be taken, eaten or carried away by said ground squirrels, or by placing in the holes or underground runways of said ground squirrels carbon-bisulphide.
>
> Section 2. Any person, firm or corporation that shall violate any of the provisions of this ordinance shall be deemed guilty of a misdemeanor and upon a conviction thereof shall be punished by a fine of not less than $25.00, and not more than $100.00 or by imprisonment in the county jail for a term not exceeding one hundred days, or by both such fine and imprisonment; one half of said fine to be paid to the informant.
>
> Section 3. All ordinances and parts of ordinances in conflict with the provisions of this ordinance are hereby repealed.
>
> Section 4. This ordinance shall take effect and be in force from and after the 2nd day of November, 1908.

Monterey County Resolution. Resolution #76-197 (April 20, 1976) states:

> WHEREAS, by reason of the lack of control of ground squirrels on Fort Hunter Liggett and Camp Roberts, the squirrel population on said reservations has reached such proportions as to create a serious health hazard as well as a serious economic loss, and
>
> WHEREAS, the use of 1080 poison is presently prohibited by Executive Order, and

WHEREAS, this Board desires that effective ground squirrel control be undertaken on Fort Hunter Liggett and Camp Roberts by the U. S. Army;

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of the County of Monterey supports the actions of the U. S. Army in obtaining through channels approval of the use of 1080 poison to control ground squirrels on Fort Hunter Liggett and Camp Roberts and environs.

San Luis Obispo County Resolution. Resolution #76-426 (June 7, 1976) states:

WHEREAS, the Federal enclave known as Camp Roberts, located in the northern portion of San Luis Obispo County has, since 1973, become the site of an evergrowing infestation of specifically the California Digger Ground Squirrel, such that said infestation now covers the entire camp consisting of approximately 42,000 acres; and

WHEREAS, the indigenous plant life of Camp Roberts has never been sufficient to sustain this evergrowing population of ground squirrel, and because this condition has become even more aggravated due to this year's drought, vast migration of ground squirrel may be reasonably anticipated to begin in the early summer of this year; and

WHEREAS, since 1973 said infestation has caused thousands of dollars of damage to surrounding property owners' crops and pasture, and said infestation is expected to cause even greater damage this year; and

WHEREAS, Kern County, which is contiguous to San Luis Obispo County, has just reported its first death from pneumonic plague in 36 years; said disease from bites of fleas carried by infected ground squirrel, the cause of death being listed as pneumonic plague, the most virulent and dangerous form of plague; and

WHEREAS, the San Luis Obispo County Health Department has characterized the potential for plague transmission by the infestation of ground squirrel at Camp Roberts as a clear and present danger to all persons living in the vicinity of said camp, and

WHEREAS, local government lacks the necessary authority to properly control such health hazards occurring in federal enclaves; and

WHEREAS, the Secretary of Defense of the United States of America has authority to order the eradication of these pests.

HOW, THEREFORE, BE IT RESOLVED by the Board of Supervisors of San Luis Obispo County that:

1. The Secretary of Defense be notified immediately that the infestation of ground squirrel at Camp Roberts poses a clear and present danger to the health and safety of residents of the County of San Luis Obispo, State of California; and

2. That the Secretary of Defense is hereby requested to take immediate action to eradicate these pests.

San Luis Obispo County Vertebrate Pest Control Policy. The Vertebrate Pest Control Policy adopted February 3, 1969, states:

1. Purpose: The purpose of this policy is to establish a uniform and equable procedure for providing assistance in vertebrate pest control to landholders in San Luis Obispo County.

2. Responsibility: The Agricultural Commissioner of San Luis Obispo County has the responsibility for implementing this policy.

3. Definitions:

a. "Vertebrate Pests" includes ground squirrels, meadow mice, jack rabbits, or any other nonprotected vertebrate pest of farm crops or of public health significance.

b. "Poison" means any economic poison used for vertebrate pest control.

c. "Bait" means materials used for rodent control which consists of a rodent food material treated with a poison.

d. "Plague areas" means those areas designated by the State Department of Public Health, in accordance with Sections 6021-6024, California Agricultural Code.

4. Authorization: Subject to applicable State laws, the Agricultural Commissioner is hereby authorized to:

a. Prepare and sell poisons and baits at cost. Sale to irresponsible persons shall be refused and quantities sold may be limited to actual needs.

b. Prescribe and enforce conditions for the safe and effective use and storage of poisons and baits as may be deemed necessary.

c. Conduct vertebrate pest control operations when feasible and necessary for the protection of public health and agriculture within the County.

d. Establish a schedule of charges for poisons and baits for sale.

5. Preference: The order of preference for conducting County Vertebrate pest control operations shall be as follows:

a. Plague areas.

b. Areas where owners of contiguous properties have requested assistance and are willing to cooperate in an area-wide vertebrate pest control program.

c. Individual properties outside of the above categories, upon request from the landholders thereof.

The primary responsibility for controlling all vertebrate pests (including ground squirrels) lies with the landholder except where specifically directed by State law.

Safety to man, domestic animals, and non-target wildlife must be stressed in all programs of vertebrate pest control.

Public Health/Plague

Federal Responsibilities

Army Regulation 40-5 (September 25, 1974) prescribes a comprehensive disease prevention and environmental enhancement program for the U. S. Army and areas under its control. The program encompasses communicable and chronic disease control, public health, environmental engineering, environmental physiology, health nursing, medical entomology, nutrition, radiological hygiene, occupational health, aviation medicine and health standards. It establishes policy and delineates areas of responsibility for commanders, medical authorities and the Surgeon General.

Army Regulation 420-76 (November 24, 1971) defines responsibilities, prescribes procedures, and in accordance with DOD Instruction 4150.7 establishes standards for:

1. The safe and efficient control of animal reservoirs and disease vectors and of pests which impair morale and efficiency of personnel and damage or destroy real property and stored supplies at Army installations.

2. The prevention of excessive pesticide contamination of installations and/or adjacent areas.

It delineates the responsibilities of the facilities engineer, engineer entomologist and installation surgeon.

Letter of the Surgeon General, August 5, 1976 to Commander U. S. Army Health Services Command, subject: Flea Control at the Fort Ord Military Complex states:

1. The Surgeon General has determined that the large ground squirrel population at the Fort Ord military complex (Fort Ord, Fort Hunter Liggett and Camp Roberts) represents a significant public health threat. Pending the results of actions to obtain an exemption to use the toxicant, "1080", for ground squirrel control, it is planned to initiate controls in areas of human habitation by trapping or the use of diphacinone. Flea control will be initiated prior to squirrel control.

2. The State of California has reported that carbaryl does not give consistent results, and recommends DDT for flea control. To be able to use DDT, a "crisis" or "specific" exemption must be sought from the Administrator of the Environmental Protection Agency. To support such a request, information must be presented to show that the currently registered product, carbaryl, is not effective.

3. Request that the necessary field tests be conducted at the Fort Ord complex to determine the efficacy of carbaryl in the control of fleas on ground squirrels, and that these tests be conducted at the earliest practical date. The results should be forwarded to HQDA, DASG-HCH-E, as soon as possible.

Excerpts from U. S. Department of Army Office of Adjutant General letter of December 3, 1976 addressed to various military commands, subject: Plague Surveillance Program states:

1. Reference Executive Order 11643, Environmental Safeguards on Activities for Animal Damage Control on Federal Lands, February 1972. (Rewritten as Executive Order 11870, July 1975, and amended by Executive Order 11917, May 1976).

2. Background:

   a. Sylvatic plague is endemic in the western third of the United States. Within recent years, the incidence of both epizootic plague and human plague cases in this section of the country has increased markedly. During 1976, plague activity in animal populations was identified at four U. S. Army installations, and 13,000 acres were treated with insecticide to control the flea vectors.

b. Referenced Executive Order prohibits the use on Federal lands of rodenticides that cause secondary poisoning effects. This prohibition, which has been in effect since 1972, has inhibited rodent control programs at some installations to such an extent that the resulting excessive rodent populations now constitute a significant threat to human health. The Surgeon General has determined that such a threat to health from plague definitely exists at Fort Ord, Fort Hunter Liggett and Camp Roberts, California.

c. Following this determination by the Army Surgeon General in July 1976, Department of the Army was designated as the DOD lead component to develop a plan to control ground squirrels and other plague-susceptible rodents at applicable DOD installations. The first required action is the development and implementation of a plague surveillance program to determine the DOD installations where rodent control programs should be instituted. The Army position with respect to control measures is that a threat to human health is the only reason to use toxicants having secondary effects.

d. This letter outlines responsibilities and provides detailed instructions for the conduct of the Army's plague surveillance program.

3. Concept of Operations:

4. This plan will be implemented at all identified installations effective 1 January 1977.

The following was an attachment to the above letter:

US ARMY INSTALLATIONS INCLUDED IN SURVEILLANCE PROGRAM AND REQUIRED SURVEILLANCE

1. The following installations are sufficiently at risk to warrant major surveillance:

a. Installations

Fort Ord, CA	Fort Hunter Liggett, CA
Camp Roberts, CA	Fort Carson, CO
Rocky Mountain Arsenal, CO	Navajo Army Depot, AZ
Fort Wingate Army Depot, NM	Fort Lewis, WA

b. Surveillance Elements.

1) Carnivore Blood Serum. Collect and submit 25 to 30 carnivore (coyote, bobcat, fox, raccoon, etc.) blood serum samples during the period February, March, and April each year.

2) Rodent and Flea Population Characterization. Develop baseline data on species and densities of rodents and fleas potentially involved in plague transmission and determine the degree of human contact with such populations. Evaluate population densities at least annually, where highly susceptible rodent species (rock squirrel, beecheyi ground squirrel, and prairie dog) occur.

3) Rodent Population Observation. Where highly susceptible rodent species occur, observe rodent populations for unusual conditions (sick, sluggish or dead animals) that may signal disease activity. Observations should be accomplished at least twice monthly when rodents are active (i.e., when the mean temperature exceeds 40°F).

4) Liaison Activities. Establish and maintain liaison with local and state health authorities to ascertain any potential plague activity in proximal civilian areas.

5) Epizootic Investigation. When unusual activity or dead animals are observed in the rodent population, or when plague activity is determined by carnivore blood serum analysis, an epizootic investigation will be initiated (as a minimum, investigations should include the collection of dead animals, trapping rodents for sera and flea collections, and swabbing burrows for fleas).

California Responsibility

The responsibility for the control of communicable disease and the protection of the community is shared by the State Department of Public Health, the local health officer and the community itself.

This responsibility is defined and fixed in two types of legislation. In Division 4, Chapters 1-6, Section 3000 and following sections of the Health and Safety Code, the functions and duties of state and local health departments are stated as are those of certain individuals, i.e., those suffering from or exposed to contagious disease and those in the community having knowledge of such persons. These are broad statutory provisions concerning quarantine, isolation, reporting, etc., with provision for legal penalties for violation of the statutes.

Health and Safety Code:

3000. "Health officer", as used in this division, includes county, city, and district health officers, and city and district health boards, but does not include advisory health boards.

3053. Upon being informed by a health officer of any contagious, infectious, or communicable disease the state department may take such measures as are necessary to ascertain the nature of the disease and prevent its spread. To that end, the state department may, if it considers it proper, take possession or control of the body of any living person, or the corpse of any deceased person.

3110. Each health officer knowing or having reason to believe that any case of the diseases made reportable by regulation of the Board of Public Health, or any other contagious, infectious or communicable disease exists, or has recently existed, within the territory under his jurisdiction, shall take such measures as may be necessary to prevent the spread of the disease or occurrence of additional cases.

Regulations of the California State Board of Public Health:

2501. Reports by Local Health Officer to State Department of Public Health. (a) Individual case reports: Each local health officer shall report at least weekly, on the prescribed form, to the Director of the State Department of Public Health each individual case of those diseases or conditions in the above list (Section 2500) which have been reported to him in the last seven days.

Note: The list referred to above includes plague which requires an immediate report by telephone or telegraph.

Letter from Surgeon General, June 11, 1976, to Jerome Lackner, Director, California Department of Public Health states:

I know you are familiar with the problems posed by the ground squirrels at the several installations in the Fort Ord military complex since the termination of control measures in 1971. Of concern to me, and I am sure also to the State of California, is the potential public health threat engendered by their excessive numbers.

The research project entitled, "Ecology and Control of Sylvatic Plague at Hunter Liggett Military Reservation", being conducted by Letterman Army Institute of Research, has yielded over 1,200 rodents during the last 16 months, none of which has been found positive for plague organisms. More recently, the trapping area has been extended

and predatory animals have been included. Serological evidence of plague infection has been found in one coyote, one feral house cat, eight dogs and one ground squirrel. This suggests that there are, or were, active plague foci on the reservation or in the vicinity. The existing surveillance evidently has not been extensive enough to locate these foci.

Aside from the surveillance aspects of the research, two of the main thrusts have been to evaluate the effects of the oral systemic insecticides, Trichlorfon and Phoxim, in controlling fleas on wild rodents, and the effectiveness of the anticoagulant rodenticide, Diphacinone, in controlling ground squirrels. While the initial results of these studies are encouraging, it seems possible that a control program might have to be initiated before the value of newer measures can be demonstrated unequivocally.

One of the possible exemptions to the Executive Order against the use of toxicants with secondary effects, including 1080, is the demonstration that a hazard to human health exists. It would appear that neither the Army nor the State can affort to wait until the threat is manifested by a case of human plague. Therefore, pending the completion of the research effort to demonstrate the effectiveness of control methods that would appear not to fall under the constraints of the Executive Order, I should appreciate having the state's position on the following issues:

1. What evidence would be appropriate to declare that the excessive number of ground squirrels constitutes a hazard to human health?

2. In the event the surveillance program results in the isolation of Pasteurella pestis from ground squirrels or other rodents, or the identification of a rodent die-off due to plague, what control measures should be instituted?

3. Would a rodent die-off in one area constitute the basis for initiating control measures in other, as yet unaffected areas?

Your timely assistance in this matter is greatly appreciated.

Response of Director Lackner, June 30, 1976, to Surgeon General states:

Thank you for your letter of June 11, 1976, routed by Major General Robert W. Green, M. D., concerning ground squirrel problems at Hunter Liggett Military Reservation and Camp Roberts.

As you know, we have been well briefed in this matter. Members of our staff participated at the hearings held at Hunter Liggett in April and have undertaken surveillance to assess the economic impact

and the epizootiological potential for plague in these areas. Through our Vector Control Section we have continued to maintain effective liaison with Army personnel at Fort Ord, and at Fitzsimmons Army Medical Center in Denver.

Responding directly to the three questions from your letter, we offer the following comments:

1. Ground squirrels that occur in areas of substantial human activity are a hazard when they or their fleas show evidence of zoonotic disease, in particular, bubonic plague. They also become a matter of concern when population levels exceed the ecological carrying capacity of the area, thereby increasing the epizootic potential should disease, such as plague, be introduced into the population. This Department has recommended that ground squirrels be sharply reduced in number at Camp Roberts in areas of significant human exposure. Ground squirrel control should be preceded by or accompanied by flea control. This includes both the central Camp area as well as the bivouac areas where maneuvers are performed. Population levels are high at Hunter Liggett, although not to the extent observed at Camp Roberts. We believe, therefore, that control should also be undertaken in areas of substantial human activity at Hunter Liggett. The consensus of specialists at the April meetings at Hunter Liggett indicated 1080 to be the rodenticide of choice, provided authorization for its use can be obtained.

2. Flea control should be initiated at the site of a plague epizootic in a locality occupied by humans and prophylactically in surrounding areas of continuous ground squirrel occurrence. The only effective method to kill fleas is to dust the insecticide directly into the burrows. Area-wide and aerial applications are ineffective and uncalled for. In our experience, DDT is the only proven effective insecticide for use against plague-infective fleas. Carbaryl, the only insecticide registered for this specific use, has performed inconsistently. Our Department and the Colorado Department of Health have set precedents this year by using DDT under the "crisis exemption" clause provided under EPA authorization.

   Because the high ground squirrel population is more or less continuous throughout the valleys at Hunter Liggett, the logistics of dusting burrows over hundreds or thousands of acres subject to use may be impracticable. Consideration might well be given to quarantining certain areas against training or other general use where flea control would have to be delayed for periods of three to six months. We do not know precisely how long plague-infected ground squirrel fleas may live away from their hosts, but three to six months should provide an ample margin of safety.

3. A determination of control measures appropriate for areas peripheral to an epizootic where rodents appear healthy and are present in moderate numbers, calls for carefully weighed judgments tailored to the situation at hand. These would consider the topography of the land, the continuity of the susceptible rodent populations, the dimensions of potential human exposure, and the extent and intensity of the epizootic. A judgment can usually best be made by medical entomologists who have had an opportunity to examine these and other relevant matters carefully.

With plague circulating in the area of Hunter Liggett, as evidenced by carnivore serology, it appears inevitable that the disease at some time in the future will enter into the highly susceptible ground squirrel population. Plague epizootics and human exposure have occurred in this area in the past. Plague occurrence has not been documented at Camp Roberts, but epizootics in past years may have occurred there undetected.

It would be our hope that the Executive Order can be waived and that effective ground squirrel control can be undertaken in the critical areas specified.

PROPOSED ACTION AND ALTERNATIVES: IMPACTS AND MITIGATIONS

Introduction

This section describes in detail the proposed action, the viable alternatives and discusses the impacts and mitigations of each. Earlier sections of the report have discussed the proposed action in general terms, described the relevant environmental features of the region and of each of the military installations -- Fort Ord, Fort Hunter Liggett and Camp Roberts. Detailed environmental information is provided on the ground squirrel life history and populations, damage by ground squirrels, grazing use and the flea/plague interrelationships -- because each of these are key factors in considering the environmental impacts of the proposed ground squirrel control programs.

The impacts of the proposed action and of the various viable alternatives are being considered together in one section because this combination seemed to be the most logical way to present a large amount of interrelated data, consider numerous alternative control measures, narrow these to a few viable alternatives and discuss the impacts in a manner that is understandable and yet minimizes repetition.

The section first discusses the various considerations to the selection of a ground squirrel control program. These include discussions of approaches to and timing and methods of ground squirrel control as well as flea control. It describes and categorizes the areas to be treated and finally outlines needs for surveillance, monitoring and testing.

The next section describes the proposed action, its objectives and the objectives of the various interest groups. The detailed methods of treatment and application are outlined for the open range, areas of human activity and special areas of concerns. The impacts resulting are identified and possible mitigation measures discussed.

The alternative section then describes a limited number of viable alternatives which should still be considered for a short-range solution to the identified problems caused by ground squirrels. These will be limited to 3 alternatives:

1) alternative chemicals for use on open range lands, 2) changes in open range land areas to be treated, and 3) no action alternative. Other control alternatives will have been discussed and evaluated earlier in this section and dismissed for a variety of reasons, i.e., not being viable or because certain features of proposed action appear to be the most attractive option available.

A summary of impacts of the various alternatives is presented and finally, the section will discuss long-range considerations and suggest recommendations for monitoring and surveillance programs and possible testing programs.

Considerations on Selecting a Ground Squirrel Control Program for Fort Ord Complex

Approaches Regarding Ground Squirrel Control

The Army has proposed a ground squirrel control program at Fort Ord, Fort Hunter Liggett and Camp Roberts to solve three types of problems caused by high ground squirrel populations: 1) threat to human health; 2) damage to adjacent crop lands; and 3) damage to military facilities. While each of these types of problems all relate to large populations of ground squirrels, the possible action which may be taken to solve them does vary, particularly as it relates to areas on which ground squirrels are controlled. The basic approach, therefore, in considering both the proposed action and in establishing alternatives for reducing ground squirrel populations is indicated in the following table.

Action on Ground Squirrel Control	Effectiveness in Minimizing Threats to Human Health	Effectiveness in Minimizing Damage to Adjacent Crops	Effectiveness in Minimizing Damage to Military Facilities
Reduction of all moderate or high populations on the 3 military establishments	X	X	X
Reduction of populations only in high human use areas	X	XXX	XX
Reduction of populations only on the perimeter of the military property	XXX	X	XXX
No action	XXX	XXX	XXX

X Best overall solution based on present information and proven technology
XX Helpful, but generally considered inadequate
XXX Doubtful value

Timing of Squirrel Control Program

Timing is a most critical part of effective ground squirrel control. Without adequate attention to the proper timing, control may be totally ineffective, resulting in wasted pesticides and potential environmental contamination without benefit.

Timing is important because unlike commensal rodents such as rats and house mice which are active year around, ground squirrels are unique because many go into hibernation in the winter and aestivation in the summer. At these periods control methods are ineffective.

Bait is most effective when the maximum number of the existing squirrels are active daily above ground and are foraging for seeds as opposed to vegetative portions of the plant. There are essentially three periods when activity is at its best: 1) the breeding period which occurs a few weeks following emergence from hibernation. Depending on the areas, this peak breeding period may last, roughly, from 3 to 6 weeks. By collecting and autopsying a random sample of the squirrels, the breeding period and progression of gestation in the female population can be ascertained quite precisely.

This breeding period of high activity often cannot be used for baiting because the squirrels, although active, are feeding principally on green forage and not on seeds, hence baits consisting of grain are normally avoided except in relatively rare situations. The use of green forage as a bait has been explored; however, it is not recommended for the California ground squirrel for reasons of potential hazard to non-target species, efficacy, costs and practicability.

As the season progresses and the young are born, daily feeding patterns of adults above ground may be varied and inconsistent which would influence the success of any type baiting program with acute toxicants. The lack of efficacy, for all practical purposes, eliminates baiting from the time litters are being dropped until the young are above ground readily consuming seeds.

2) Another period of high squirrel activity occurs when the majority of young squirrels have been born and are above ground foraging for and eating seed. Most of the California ground squirrel control is conducted at this period. It is an optimum time because of the high squirrel activity above ground and because they are accustomed to eating on seeds, which means they will usually take grain bait. A determination of grain acceptance should always precede

baiting programs. This optimum period for squirrel control is roughly 6 to 8 weeks long, and in Monterey and San Luis Obispo counties it generally falls in the months of May and June. Weather conditions and habitat may influence the exact dates of this period. This ideal control period is of a relatively short duration, for it abruptly stops when adult squirrels go into aestivation (summer sleep), which is frequently brought about by high daytime temperatures.

Fumigants (i.e. methyl bromide, carbon bisulphide, or gas cartridges) are useful from the breeding period through the time aestivation commences (roughly February through June). Fumigants tend to become less effective as the soil moisture decreases, hence in Monterey and San Luis Obispo counties of California they are most effective in the Winter and Spring when seasonal rains keep the soil moist. The use of fumigants diminishes as the soil dries.

3) The third period of high activity may occur in the Fall of the year as the daytime temperatures subside. When this occurs many of the aestivating squirrels become active and are again feeding on seed and on acorns if present. Full or nearly full activity may not occur each year at this period; this is believed to be linked to the weather conditions. Because of this uncertainty, major squirrel control operations cannot be geared to this period; however, this period can be used for controlling squirrels missed during the Spring control. Squirrels are often hoarding grain at this time of the year and gather seeds and grain in their cheek pouches to carry into their burrows. If strychnine baits are to be used they are most effective when hoarding is occurring because strychnine is absorbed more rapidly through the cheek pouches than the intestinal tract. Anticoagulant baits may also be effectively used around buildings and other structures at this time of year. Grain bait of any type may not be sufficiently acceptable for control once the squirrels are feeding regularly on acorns, almonds or the like, and hence baiting may have to be delayed until the next year. This period of Fall activity stops with the onset of hibernation.

It is easy to be fooled on periods of activity, especially if the population trends have not been followed throughout the year or if existing squirrels are not examined closely. The tendency is to not recognize diminishing activity; this is brought about by the fact that squirrels born in the Spring may neither aestivate or hibernate. Thus, sub-adults may be active throughout the Summer, Fall and Winter, but it must be remembered that they represent only a fraction of the total population. Control conducted when the adults are aestivating or hibernating is superficial and short-lived and can seldom be justified based on cost/benefits.

Methods of Ground Squirrel Control

Chemical Control. All information on characteristics, pharmacology and toxicity of the following rodenticides, where not otherwise referenced, is taken from the California Department of Food and Agriculture Vertebrate Pest Control Handbook (1975). Additional information on LD_{50}'s, symptomatology and antidotes can be found in the same publication.

Toxicants.

Sodium monofluoroacetate (compound 1080) is a white, stable, water soluble, practically tasteless, crystalline powder.

Compound 1080 is a rapidly absorbed toxicant. Death usually results in one half to two hours (Howard, 1959) from cardiac or nervous system failure. Monacetin, acetamide, procainamide, and acetate plus ethanol show some antidotal effects (Atzert, 1971). Monacetin is not available in pharmaceutical grade.

Compound 1080 has an extremely wide variation in susceptibility among different animals. Rodents such as ground squirrels and pocket gophers are highly susceptible. Fish are very tolerant to 1080 (King and Penfound, 1946). Birds are generally quite tolerant, e.g. golden eagle (LD_{50}, 1.25-5.0 mg/kg), Merriam's turkeys (4.0 mg/kg), mourning doves (8.55-14.6 mg/kg), coturnix (17.7 mg/kg), chukars (3.51 mg/kg), and pheasants (6.46 mg/kg) (Cain, et.al.); however, California quail are susceptible (Sayama and Burnetti, 1951) and waterfowl have been found to be susceptible under situations of high competition for food (Koehler, 1962). Livestock are susceptible (Jensen, et.al., 1948). There were 37 known domestic animal poisonings between 1959 and 1969 (Atzert, 1971). However, most of these were related to the animals gaining direct access to bait containers rather than to bait exposed in the field for control. No human fatality from 1080 has ever occurred in California despite its long history of use (Marsh, pers. comm.).

Compound 1080 is absorbed in the muscles and tissues of poisoned animals and therefore increases the potential of becoming a secondary poison. Members of the dog and cat family are very susceptible (Hagen, 1972; Schitoskey, 1975). Raptors and scavenging birds apparently are seldom affected (Atzert, 1971).

Poisoned animals may metabolize 1080 to non-toxic metabolites and/or excrete in the urine large quantities of a dose prior to death, thus decreasing the hazard of true secondary poisoning (Gal, et.al., 1961 In: Atzert, 1971). However, according to Swick (1973) rodents may consume or pouch several times the lethal dose creating a greater potential secondary poisoning hazard. It has also been shown that carcasses of rats poisoned with 1080 remained toxic 8-10 weeks (Pattison, 1959).

The efficacy of 1080 poison depends on many variables. In the laboratory, marked resistance to 1080 can be artificially produced in Norway rats within 4-5 generations (Howard, et.al., 1973). Although repeated doses of 1080 have been demonstrated to increase the resistance of rats to subsequent doses, this effect appears to be short-lived and of little practical significance in its use as a rodenticide (Vertebrate Pest Control Handbook, 1975; Atzert, 1971). Rodents receiving sublethal doses may develop bait shyness (Tull Chemical Company, n.d.). However, field studies using aerial 1080 to control ground squirrels have resulted in 90 percent population reductions after treatment (Marsh, 1967).

David & Gardiner (1966) found that 1080 was not mobile or persistent in the soil and was rapidly degraded to nontoxic compounds by soil bacteria. They found no measurable toxicity in the soil after two weeks. Compound 1080 is also absorbed by plant roots and other cellulose material, with 5-10 percent transported to the leaves (Hilton, et.al., 1969, In: Atzert, 1971). Saito, et.al. (1966 in Atzert, 1971) analyzed streams over a 5-month period and found no trace of 1080. Marsh (1967) found no trace of 1080 oat groat bait after the winter rainy season. There is also no evidence that hazardous amounts of 1080 can accumulate in the meat of carcasses used for human consumption (Peters, 1975). 1080 decomposes at temperatures over 200°F. Peters was unable to detect organofluorine residues in oven-baked meat innoculated with physiological amounts of 1080 prior to baking (Peters, 1975).

Compound 1080 is registered for ground squirrel control by the state. EPA placed it on a rebuttal presumption list and on December 1, 1976 issued notice that a rebuttal presumption exists against registration and continued registration. Crimped oat groats is the most commonly recommended bait. Compound 1080 can be applied by hand or aerially with a poison concentration of 0.05 or 0.08 percent respectively. For aerial treatment, pilot and plane costs are approximately $90.00 - $150 per hour (Nutter, pers. comm. and Marsh, pers. comm.). Depending on squirrel densities, pilots generally can cover

approximately 2,000 to 3,000 acres per hour, spot-treating the squirrel colonies. Prepared bait costs approximately $0.25 per pound. The total cost of aerial 1080 application in Tulare County (1975) was estimated at $0.14 to $0.16 per acre (Clark, pers. comm.). Ground application of 1080 was estimated to cost $1.63 per acre in Fresno County in 1975 (Clark, pers. comm.) (Table 11).

Compound 1080 is an effective rodenticide. It is the most commonly used rodenticide for control of ground squirrels in California (Clark, pers. comm.). Because of 1080's toxicity, its use for ground squirrel control in close proximity to humans and their pets is not recommended (Jenkins and Koehler, 1948), but because of its efficacy, 1080 is considered a viable method for large-scale control of ground squirrels on the Fort Ord complex.

Zinc phosphide (Zn_3P_2) is a gray-black powder that is practically insoluble in water or alcohol. When exposed to moisture, a breakdown slowly occurs, releasing small amounts of phosphine gas. Containerized dry baits remain toxic almost indefinitely and exposed baits are known to maintain toxicity for several months under field conditions (Keith and O'Neill, 1964).

Zinc phosphide baits have a strong phosphorus-like odor. This garlic-like odor characteristic is attractive to some rodents, such as rats, but is often unattractive to other animals. Bait acceptance by ground squirrels has been poor in some areas (California Department of Food and Agriculture, 1974).

Zinc phosphide is poisonous in some degree to all animals. There is no specific antidote. Gallinaceous birds and waterfowl are highly susceptible to poisoning (Hood, 1972). Some species of fish may be susceptible to high concentrations of phosphine gas (California State Water Resources Control Board, 1971). Following ingestion, it takes from 30 minutes to 2 hours for death to occur (Dana, 1962).

Zinc phosphide does not accumulate in the muscles or other tissues of poisoned animals, reducing some of its secondary poisoning potential. However, complete breakdown of zinc phosphide in the stomach may require several days and thus, secondary poisoning can occur if an animal eats enough gut contents of a recently poisoned animal (Rudd and Genelley, 1956).

According to Hood (1972), zinc phosphide does not seriously contaminate the environment. Zinc phosphide is absorbed by the soil and breakdown is rapid. It is also absorbed by roots and leaves of plants, but appears to be transformed to non-toxic chemicals. Breakdown in water occurs relatively slowly (Robinson and Hilton, 1971, In: Hood, 1972).

Zinc phosphide is registered in California for ground squirrel control and is currently being considered for registration by the Environmental Protection Agency (EPA). Crimped oat groats is most often the recommended bait. Zinc phosphide can be applied by hand or by aircraft. The recommended poison concentration for hand baiting is .8 percent and 1.69 percent for aerial baiting. Mixed grain bait costs approximately 30 cents per pound (Nutter, pers. comm.). Aircraft and pilot costs would be similar to those stated for 1080 treatment. The total cost of aerial application of zinc phosphide in Fresno and San Benito Counties was estimated at $0.09 to $0.17 per acre in 1975 (Clark, pers. comm.; Schilling, 1976). Hand application of zinc phosphide in Fresno County in 1975 cost approximately $1.92 per acre (Shilling, 1977) (Table 11).

Zinc phosphide bait is considered a moderately effective poison for ground squirrels, often giving erratic control that is good at times, but fair to poor generally (Marsh, pers. comm.). The expected percent of control of the Beechey ground squirrel, using zinc phosphide baits, can reasonably be placed at approximately 60 percent, on an average, based on general information in the literature and the consensus of those individuals in California knowledgeable of the subject (Marsh, pers. comm.)., including those who have evaluated zinc phosphide in San Luis Obispo (Kalar, pers. comm.) and Monterey Counties (Nutter, pers. comm.).

Strychnine is a white crystalline powder with a characteristic bitter taste. It is available in an alkaloid or sulfate form. The alkaloid form is practically insoluble in water and very stable. However, when transformed to an acid-salt compound it becomes water soluble and is subject to leaching in acid soils. The sulfate form is slightly soluble in water.

Strychnine is a fast-acting rodenticide usually taking from 5 to 30 minutes for death to occur. The poison is absorbed most rapidly through the cheek pouches in ground squirrels, taking one fifth of the quantity of strychnine to kill as is required through the stomach (Dana, 1962). In one field study, approximately 20 percent of poisoned ground squirrels died above ground and thus were available to scavengers or predators (California Department of Food and Agriculture, 1974).

According to Hood (1972) strychnine baits are poorly accepted by ground squirrels. However, this depends on the species and sometimes the subspecies. One study showed a bait acceptance of only 11.4 percent (California Department of Food and Agriculture, 1974). Because of its fast-acting nature, strychnine baits must be exposed in sufficient amounts to ensure that each squirrel will find enough bait within a few minutes to obtain a lethal dose. Otherwise, a sublethal dose might be taken resulting in bait or poison shyness (Howard, 1959).

Strychnine is extremely poisonous in various degrees to most birds and mammals. It is somewhat less toxic to gallinaceous birds than other birds. Waterfowl and some domestic animals readily accept lethal amounts of strychnine bait. Antidotes are available and can be effective if treatment is initiated very soon after poisoning.

Strychnine is not absorbed into muscles or tissues of a poisoned animal. However, residues in the stomach of a lethally poisoned animal are known to be potentially hazardous to susceptible predators or scavengers that might consume the stomach contents. Secondary poisoning of raptors is thought to be unlikely. According to Hagen (1972) condors are believed highly susceptible to strychnine poisoning, although there are no reports of condors being killed as a result of strychnine use for ground squirrel control.

Strychnine is registered by the state for control of ground squirrels. It is on EPA's rebuttal presumption list for above-ground use and on December 1, 1976, EPA issued notice that a rebuttal presumption exists against registration and continued registration. Whole barley is often the recommended bait with a strychnine concentration of 0.2 percent. Bait should be hand placed; aerial baiting is not recommended for squirrel control. Mixed grain bait costs approximately $0.80 per pound. The total cost of hand application of strychnine in Sacramento County was estimated at $2.00 per acre in 1976 (Miller, pers. comm) (Table 11).

The subspecies of ground squirrel, Spermophilus beecheyi beecheyi, occurring in Monterey and San Luis Obispo Counties, is less susceptible to strychnine and is more apt to reject strychnine, hence such baits are presently used infrequently for control of ground squirrels in that region of California (Marsh, pers. comm.). Unless toxic shyness or resistance to other acute toxicants occurs, strychnine should not be considered a viable alternative for ground squirrel control on the Ford Ord complex.

Anticoagulants. Anticoagulant compounds used in rodent control belong to two groups: the hydroxycoumarins (e.g., warfarin and Fumarin) and the indandiones (e.g., diphacinone, Pival and chorophacinone). Most anticoagulants are stable compounds. Their sodium salts are soluble in water and often are used as lethal water baits.

Anticoagulants, which cause death by reducing the clotting ability of the blood, have the same effect on all warm-blooded animals. Relatively low doses of anticoagulants are poisonous to ground squirrels and many other rodents if consumed by multiple feedings over a period of several days. The same amount of poison bait if consumed in one feeding might have no poisonous effect. Antidotes are transfusion of whole blood and oral doses of vitamin K.

The potential of secondary poisoning from anticoagulants has been reported because they accumulate in the liver of a poisoned animal. All mammals and birds are susceptible to anticoagulant baits but not to the same degree. Birds apparently are less susceptible than other animals. Pets would have to consume a quantity of bait over several days to be poisoned. However, some poisonings in dogs and cats have been reported. There is little danger to livestock unless exposed to large quantities of stored poison biat. Gopher snakes fed poisoned meadow mice were not adversely affected.

Some resistance to anticoagulants through genetic mutation has been shown in rats. In addition, the effects of anticoagulants may be nullified in rodents that consume larger quantities of green feed containing vitamin K (Howard, 1959).

In Monterey and San Luis Obispo Counties the most commonly used anticoagulant is diphacinone. It is registered in California, but not with EPA for control of ground squirrels. Oat groats are recommended with a poison concentration of 0.005 percent when used in bait boxes or 0.01 percent when spot-baited. Because of the lack of adequate research data, aerial application is not recommended. Mixed bait costs approximately $0.30 per pound. A follow-up treatment in two days is necessary (Nutter, pers. comm.). Hand baiting of diphacinone has been estimated to cost approximately $6.43 per acre (Marsh, pers. comm.) (Table 11).

The anticoagulant rodenticide, diphacinone, is an effective rodenticide for ground squirrel control, and its use, along with that of other anticoagulants such as Fumarin, Pival and chlorophacinone, has been steadily increasing for squirrel control over the last ten years. Ninety percent or greater control is possible with the exception of situations where highly preferred alternative foods are available (i.e., walnuts, almonds, acorns) to squirrels.

Table 11

ESTIMATED COSTS OF GROUND SQUIRREL RODENTICIDE USE

Rodenticide (Bait)	Approximate Dollar Cost Per Pound	Cost Excluding Labor[1]	Cost Including Labor[1]	Method of Application
Compound 1080	0.20	0.07	0.17	Air
Compound 1080	0.20	0.02	1.63	Hand
Zinc phosphide	0.30	0.09	0.19	Air
Zinc phosphide	0.30	0.02	1.92	Hand
Strychnine	0.80			Hand
Diphacinone	0.30-1.00	2.20	6.43	Hand
Methyl bromide	0.86	NA	21.60	Applicator
Carbon bisulphide	1.60[2]	NA	$5.12-$7.04	Waste ball

[1] Based on estimates or actual field use in Sacramento, Fresno, Tulare, Alameda and San Benito Counties in 1975-1976. Schilling, pers. comm.; Miller, pers. comm.; and Marsh, pers. comm. Cost per acre may vary considerably depending on squirrel density, terrain, etc.

[2] Cost is per gallon.

Anticoagulants are accumulative toxicants requiring several (preferably daily) feedings to produce death, and death may be delayed for 5 to 10 days following the ingestion of a lethal dose. To provide sufficient bait for multiple feedings for the squirrels, bait is exposed in a bait box or bait station which confines the material to a central location and yet permits the squirrels to have access. As the bait is depleted in the station, more must be added until the desired degree of control is achieved. Bait stations restrict access to squirrels or smaller size animals. Some primary poisoning can be expected in nontarget species which gain access to the bait. Secondary poisoning will be minimal.

For control on the Ford Ord complex, it is estimated that one station would be needed for about every 50 burrows. Although burrows themselves may be a poor measure of the number of actual squirrels present, it is the best guide known for initially setting up bait stations. As the bait station begins to be utilized, the number of stations is increased or decreased as bait consumption evidence indicates. Where the burrows are uniformly scattered over a relatively large area of a few acres or more, the bait stations might be more efficiently spaced at 200 feet intervals in a type of grid system, even if burrow counts would suggest more. One station per 50 burrows could still be used in those areas where the colonies were distinct and more or less isolated. It is virtually impossible to calculate with any high degree of accuracy the number of bait stations needed to treat large acreages, but away from man-made structures one per acre of suitable squirrel habitat, excluding cantonment areas and other very high human use areas, would seem a reasonable average figure for Fort Hunter Liggett and Camp Roberts. Diphacinone's use in cantonment and other human use areas is discussed elsewhere.

Using the figure of one bait station per acre would require 89,500 bait stations in the open range area if all the area were treated at one time. To avoid such a large investment in bait stations, the area might be appropriately divided and treated in three sections so that only one-third the number of stations would be needed at one time (29,833), moving the stations from one section to another as control was accomplished. The cost of bait stations varies considerably depending on durability, complexity and whether they are sufficiently waterproof to keep the bait dry in the event of rain. A waterproof station is not needed if baiting is restricted to periods of no anticipated rainfall. If the bait gets wet, it will mold and spoil and be unacceptable to the squirrels.

Bait stations should be designed so they will not be easily overturned or opened by larger wildlife species (i.e., deer, skunk). EPA recommends that a tamperproof bait station be used when conducting rat control out-of-doors with grain baits. Different types of stations may be needed in different areas of an installation. Where vandalism is high, sturdy stations may be needed, including a chain and padlock in special situations. Based on problems of vandalism and theft, and also breakage of stations by deer and livestock which have occurred in other similar use situations, a loss of 10 percent of the stations could be anticipated for each 3- or 4-month period. An extra supply of stations would always have to be available if needed.

The cost of a suitable bait station, which would include appropriate warnings stenciled on them (possibly in two languages) is estimated at $5 each. The cost of 29,833 bait stations -- enough for Fort Hunter Liggett is divided and treated in three separate sections -- would amount to $149,165 as the initial investment. Well-built stations should last at least 5 control seasons if removed and properly stored when not in use. However, if prorated over 5 years, it would reduce seasonal cost to $1 per bait station. A replacement of 10 percent of the stations would amount fo 2,983 stations (at $5) and $14,915 for each control season.

The placement of bait stations in the field initially will be time-consuming. The stations would be hauled into the field on trucks and then hand-carried to the location of placement. Where the truck can be driven right to the location, little walking will be necessary. However, where the terrain does not permit this, considerable walking may be necessary. Considering the squirrel habitat of 89,500 acres on Fort Hunter Liggett, a rough estimate of the average time for the initial placement of the bait station would be 6 per hour with a 4-man team hauling and placing 192 stations (not filled with bait) per day.

Another team would follow to fill each station with from 5 to 15 pounds, depending on the number of burrows and other signs indicating density. The initial filling of the bait stations would require about the same amount of time as the station placement (i.e., 192 stations per 4-man team per day). Wages are calculated to be at $3 per hour or $24 per day for each of the 4-man teams and for one supervisor for each of the 4 teams. Each team would average approximately 40 miles of truck travel per day at $0.15 per mile or $6 per day, with approximately 10 gallons of gasoline used per day. Using 32 (4-man) teams, it would take approximately 10 working days to initially place and fill the bait stations on one-third of Fort Hunter Liggett. The cost per station for initial placement and filling would be $1.14 or $102,030 for

all 89,500 acres. The bait stations should be checked or serviced at least once a week to replenish consumed bait. It is anticipated that on an average, 3 such checkings will be necessary per station. Working in 4-man teams about twice as many stations (384 per day) would be rechecked in the same time it required to fill them initially. Including supervision and vehicle expenses, it would cost $0.285 per station for all reservicing ($25,507.50 for 89,500 acres).

The expenses associated with removing stations and remaining bait from the field would be expected to be the same as for initially setting them up, i.e., $1.14 per station.

The cost of anticoagulant varies depending on the source. If it is obtained from county agricultural commissioners, who sell it to recover the cost of materials, then it would be about $0.30 per pound. However, the counties' mixing facilities are not large enough to prepare the volume of bait needed without several months' lead time. Thus, if this approach is undertaken, bait may have to be purchased through commercial sources and the cost may vary between $0.60 and $1.00 per pound, depending on the formulation. Commercial baits are not prepared on crimped oat groats but are more complex formulations.

If the low cost of $0.30 per pound is used and an average of 7 pounds of bait were consumed from each station, the cost of bait used would be $2.10 per station or $187,950 for 89,500 acres. Since the nature of the toxicant requires that bait be present at all times, the bait station will still contain some uneaten bait at the end of the project. This bait, if not contaminated with insects or mold, can be used elsewhere, but initially bait in excess of that which is actually consumed would have to be disposed of. Calculating at 1 pound per station of uneaten bait, the cost would be $8,949.90 for the last one-third of Fort Hunter Liggett treated. The cost of all the bait would be $196,899.90 or $2.90 per acre.

Cost of bait stations for one-third of area	$149,165.00
Cost of bait (656,333 pounds @ $0.30 per pound)	196,899.90
Cost of initially setting up and filling bait stations	102,030.00
Cost of reservicing stations (average 3 times)	25,507.50
Cost of removing bait stations from field	102,030.00
TOTAL	$575,632.40

As shown, a cost of $575,632.40 or $6.43 per acre would be involved in conducting a squirrel control program with diphacinone on all open range of Fort Hunter Liggett. If only the buffer zone (27,000 acres) was treated, the cost would be proportionally less $173,610). It is anticipated that the cost per acre on Camp Roberts would be approximately the same, with 39,000 acres costing $250,770.

In some areas of the open range (i.e., impact areas) the diphacinone bait-station approach could not be used, nor could stations be used in areas having cross-country traffic or maneuvering of tanks, trucks or other military equipment because the stations would be destroyed.

Since no squirrel control project of this magnitude has ever been undertaken before with diphacinone, all costs provided are based on much smaller control efforts. The cost of placing and maintaining bait stations in the rangeland would be considerably more than the cost of using bait stations in the cantonments and other areas of high human use because of the differences in distances, lack of roads and lack of access other than by packing in the materials by foot.

Diphacinone has been used safely and effectively around homes and farms and in small-scale field situations, but because large quantities of bait must be exposed in multiple doses, large-scale field use is prohibitively expensive (Hagen, 1972). Therefore diphacinone or other anticoagulants should be considered a feasible control method only for small-scale use on the Fort Ord complex.

Fumigants. Three fumigants have historically been used for small-scale ground squirrel control in California. These are methyl bromide, carbon bisulphide and gas cartridges.

None of these fumigants is effective on hibernating or aestivating squirrels because toxic amounts of their vapors cannot readily penetrate the soil plug built by the squirrel. Ground squirrels may also plug their burrow against poisonous vapors making slowly diffusing gases less effective (Dana, 1962).

Methyl bromide (CH_3Br) is a colorless, nonflammable liquid. It has a burning taste and for all practical purposes is odorless. Often 2 percent chloropicrin gas is combined as a warning agent to give it an identifiable odor. Methyl bromide vapors are 3.5 times heavier than air and will flow to the lowest parts of a burrow system.

Vapors of methyl bromide are poisonous to all animals and to all stages of fleas or other ectoparasites. Death occurs relatively rapidly from respiratory or nervous system failure. Injury may also occur from contact of the liquid with the skin.

Methyl bromide is registered by the state but apparently not by EPA for use in ground squirrel control (Fitzwater, 1972). It is usually packaged in one-pound pressurized containers or larger metal cylinders. Methyl bromide is effective when injected at a rate of 10 cc per burrow. To prevent the gas from escaping, the burrow is then immediately plugged with soil. It can be used in dry or moist soil, but not wherever rocks or other obstacles prevent sealing of the burrow with dirt (Dana, 1962). The gas costs approximately $0.86 per pound. The total cost of methyl bromide use in Alameda County in 1975 was approximately $21.60 per acre (Clark, pers. comm.) (Table 11). Therefore, the cost and considerable labor requirements, prohibits its use in large-scale ground squirrel control especially in rugged terrain (Hagen, 1972).

Carbon bisulphide or disulphide (CS_2) is a clear, colorless volatile liquid. It is extremely inflammable, which creates operational and storage hazards, and is slightly soluble in water. The commercial grade carbon bisulphide has a strong sulfur odor. Its vapors are 2.5 times heavier than air.

Carbon bisulphide vapors are poisonous to all animals. When the liquid vaporizes slowly, it may have a slow physiological effect on the target species (Dana, 1962). Prolonged or repeated contact with the skin or oral intake is also harmful. Acute poisoning in man is rare. However, chronic poisoning may occur resulting in injury to the nervous system. Carbon bisulphide vapors at high concentrations can be harmful to tree roots and other plant life (Marsh, 1964).

Carbon bisulphide is registered by the state and by EPA for use in ground squirrel control. It is normally applied in one of two ways: with a special pump (i.e., Demon Rodent Gun) to force 2-4 ounces of liquid gas into the burrow or by soaking waste balls (absorbent fibers) in the liquid and then placing them 15 to 18 inches down into each burrow (Dana, 1962). In both methods, the burrow is then plugged with soil. Carbon bisulphide vaporizes more quickly when using a pump and is thus more effective than the waste ball method (Dana, 1962). Carbon bisulphide costs approximately $1.60 per gallon. The estimated total cost of carbon bisulphide use in Fresno and Tulare Counties in 1975 ranged from $5.12 to $7.04 per acre (Clark, pers. comm.) (Table 11). Therefore, the cost and labor requirements of carbon bisulphide use make this method of ground squirrel control too costly for extensive field use.

Gas cartridges, also referred to as pyrotechnic or smoke cartridges, are cardboard cylinders filled with sulphur (10.84 percent), charcoal (17.34 percent), red phosphorus (3.2 percent), mineral oil (14.09 percent), sodium nitrate (43.36 percent), sawdust (3.52 percent) and other inert ingredients. These contents are ignited with a fuse.

The cartridges release smoke and toxic gases. Carbon monoxide is the major product, which if inhaled in sufficient quantities, is toxic to all animal life.

Gas cartridges manufactured by the U. S. Fish and Wildlife Service are registered by the state and by EPA. One or two gas cartridges per burrow are effective followed by plugging with soil. They should be used when soils are moist. Gas cartridges cost approximately $0.15 each. Because of the expense and labor requirements, large-scale use of gas cartridges would be prohibitively expensive.

A wide selection of *other fumigants* including, but not limited to, carbon monoxide (CO), sulfur dioxide (SO_2), hydrocyanic acid gas (HCN), calcium cyanide (CaCN), chloropicrin (CCl_3NO_2) and tetrachloroethane ($C_2H_2Cl_4$) have been tried over the years with varying efficacy for the control of ground squirrels (Storer and Jameson, 1965). The fumes of gasoline have also been used as a fumigant, but it is not generally accepted and probably never will be unless other fumigants become unavailable. The EPA compendium also lists the seldom used fumigants: ethylene dichloride and paradichlorobenzene, as registered for ground squirrels (Fitzwater, 1972). The most recent fumigant to be tested for ground squirrels appears to have been phostoxin, but it is not registered for use.

The above-mentioned fumigants seem at this time to offer insufficient advantages, considering human safety, efficacy to target species, hazards to nontarget species, and cost and ease of application, over fumigants such as methyl bromide (CH_3Br) or carbon bisulphide (CS_2) to warrant their use. The question of registration at both the state and federal level must be addressed before their use could be considered and therefore, should not be considered as alternative methods of ground squirrel control on the Fort Ord complex.

Chemosterilants. Chemosterilants have been studied with considerable intensity in the past few years, particularly for the control of rats (Rattus sp.) and to a lesser extent some other pest rodent species (Marsh and Howard, 1973). Mestranol, a potent synthetic estrogen, has been experimentally evaluated on the Richardson's ground squirrel with some promise (Alsager,

1972; Goulet and Sadleir, 1974). The application of chemosterilants in integrated control programs appears to offer the greatest hope. The use of chemosterilants as a follow-up to the use of toxic baits or other conventional methods of direct reductional control could provide the maximum benefits by slowing down the potential for population recovery (Marsh and Howard, 1973). However, chemosterilants cannot be considered a feasible alternative to the immediate ground squirrel problem of the Fort Ord complex because none is presently registered for rodent control in California or by EPA.

Chemical Repellents. There are no known effective chemical repellents which can be used to move or displace ground squirrels from a site. Naphthalene granules are listed as an EPA registered repellent for tree squirrels, *Sciurus* sp., (Fitzwater, 1972). This material has been suggested for ridding attics of tree squirrels (Eadie and Hamilton, 1962). The efficacy of naphthalene as a repellent has not been proven for the California ground squirrel. Present technology seems to rule out the possibility of area chemical repellents for the control of ground squirrels (Marsh, pers. comm.). Therefore, chemical repellents cannot be considered a feasible alternative to the immediate ground squirrel problem at the Fort Ord complex.

New Rodenticides. A number of potential rodenticides have been evaluated on commensal rats and mice over the past 10 years, however, few of these have been evaluated on the California ground squirrel. The newest rodenticide registered by the California State Department of Food and Agriculture for ground squirrels is the anticoagulant, chlorophacinone. The experimental acute toxicant Silatrane was evaluated for ground squirrel control, but effectiveness was below that achieved with present rodenticides. This proprietary compound was never developed as a rodenticide. Gophacide was also explored for ground squirrel control, but without good results. Fluoroacetamide (1081) would possibly be effective for squirrel control, although no known studies exist (Marsh, pers. comm.). One of the most promising potential rodenticides for ground squirrels was recently reported by Marsh and Howard (1975). This experimental toxicant is coded RH-908 by Rohm and Haas Company.

The Federal Pesticide Law and EPA's regulations concerning existing rodenticides establish a rather adverse climate for the development of new rodenticides for use on field rodents of limited distribution. Because of the high costs involved in registration and the relatively small market, private industry, for the most part, seems uninterested in the

development of new rodenticides for limited uses. The U. S. Fish and Wildlife Service, the leading federal agency responsible for the development of field rodent control measures, has not developed an effective ground squirrel toxicant since they developed 1080 for ground squirrel and prairie dog control. The prospects of new acute rodenticides for ground squirrel control appear remote.

See Appendix F for examples of rodenticide specimen labels currently used in California.

Mechanical Control.

Trapping. According to the California Department of Food and Agriculture Vertebrate Pest Control Handbook (1975), trapping can be a "practical means of control for ground squirrels where other methods are unsatisfactory or undesirable". Two general types of traps, live-catch and kill, could be used to reduce the ground squirrel population at the Fort Ord complex. Both types of traps have been used to remove populations of ground squirrels over small areas. A large-scale trapping program such as would be needed to effect adequate ground squirrel control for this project has not to our knowledge been undertaken. A trap that kills quickly can be constructed by modifying a wooden box-type gopher trap (California 44 trap) (Becker, 1940; Marsh and Plesse, 1964). Grain, walnuts, citrus, and melon rinds are effective baits, depending on the area. A dozen such traps can be used effectively to remove a small population of squirrels. The traps are quite selective, depending on where set and what bait is used. They kill instantly and probably do not leave trap-wise squirrels (Storer and Jameson, 1965).

Live catch traps (such as the National or Havahart traps) are also used to take squirrels but are generally less effective and require more attention than modified box-type pocket gopher traps. They also present the problem of live squirrel disposition.

Field use of trapping to control ground squirrels has met with varying success. Horn and Fitch (1946) found little success with live traps because of trap shyness, but were successful with steel traps and wire box traps. Dana (1962) described a live catch trap and steel trap that was effective against ground squirrels. However, Hagen (1972) found trapping an ineffective and expensive means of ground squirrel control in California, while Weinburgh (1964) stated that trapping was effective, but only for removal of small local populations or for cleaning up of those escaping poisoning.

The method of trapping squirrels depends on the type of trap used. Kill traps would be placed in the vicinity of a squirrel colony unset and baited with a preferred food item for 3 days. After this prebaiting period, these traps would be set and would remain at the colony for a minimum of 1 week or until control was achieved. Initially most of the squirrel population may avoid the traps as the trap represents a new object in their home range (neophobia). After several days this avoidance will decrease. As the squirrel population is decreased, trapping success catches per man-day will be significantly reduced. The overall efficiency of kill traps using modified pocket gopher box traps (Marsh and Plesse, 1964) is influenced by the squirrel population density and the skill of the trapper as well as other factors such as weather. An average daily trapping efficiency for Fort Hunter Liggett is estimated at 20 percent (20 animals caught for each 100 traps set).

The placement of traps in the field will vary depending on the squirrel density and terrain. The traps would be hauled into the field on trucks and then hand carried to the exact location of placement. A good trapper should be able to set on an average 150 traps per day. It should take a man one day to check, reset and bait 300 traps. Approximately 200 traps per day could be retrieved from the field by one man at the end of the program. The cost of each trap is approximately $3.50. If prorated over 5 years, the seasonal cost per trap would be $0.70.

To calculate the trapping costs, the squirrel population will be assumed at 5 per acre and well distributed over their habitat. To reduce the squirrels by approximately 90 percent over Fort Hunter Liggett in about a 2-month period using 30 teams of 4 men each are needed. The area would be divided and trapped in 8 equal areas. Trapping would progress from one area to another as the populations were controlled. It would take approximately 38,038 traps to remove 90 percent of the calculated 447,500 squirrels on all of the 89,500 acres of suitable squirrel habitat of Fort Hunter Liggett. Setting traps for the entire complex would require 2,020 man days. Checking these traps during the 6 days would take 6,088 man days. Retrieval of the traps would require 1,522 man days. A crew of approximately 120 men would be required to carryout this program in 80 working days. Four crew leaders would be required to supervise the program. If all wages are calculated at $24 per day per man, the labor costs for the program will be $238,080. Each team of 4 men would average approximately 40 miles of truck travel per day at $0.15 per mile or $6 per day, with approximately 10 gallons of gasoline used per day. Vehicle costs for the program would be $14,400.

The following is an estimated cost breakdown of the trapping program for Fort Hunter Liggett:

Labor for the Total Trapping Program

Cost of initially setting the traps	$ 48,696
Cost of checking, resetting the traps	146,112
Costs of removing traps	36,528
Supervisor costs	7,680
Cost of traps (@ $3.50/trap)	133,133
Vehicle costs (@ $0.15/mile)	14,400
Total (Fort Hunter Liggett, 89,500 acres)	$386,549

The total cost of conducting this trapping program over the entire area (89,500 acres) would be $386,549 or $4.32 per acre. If only the buffer zone (27,000 acres) was treated, the cost would be proportionally less ($116,640). It is estimated that the cost per acre on Camp Roberts would be approximately the same, with 39,000 acres costing $168,480.

If live traps were used, the cost of the trapping program would be significantly higher. The cost of these traps would be about double. While each trapper would be able to set and reservice about the same number of traps, the catch efficiency would be one-half of that achieved with kill traps. Thus personnel costs would approximately double.

Because of the expense and manpower that would be needed as well as the non-selectivity of some types of traps, trapping would not be practical for large-scale ground squirrel control on the Fort Ord complex, but could be beneficial in human use areas where other small-scale control methods might be undesirable.

Shooting. Shooting with a .22 caliber rifle equipped with a scope is a very selective method of controlling small numbers of ground squirrels (Weinburgh, 1964). If used with discretion, there is no hazard to humans or other non-target species. Shooting has been used to control small numbers of squirrels; in fact, some ranchers have in the past encouraged shooting by outside hunters. Hunting of squirrels is most effective where squirrels are not too dense. Squirrels were once used for food, but since the early days when plague was found to infect squirrels, this practice has been discouraged by health officials.

Shooting is particularly useful for the relatively rapid collection of random squirrel specimens for determining flea indexes, breeding condition, littering dates, litter sizes, sex ratios and diets, all of which may be helpful in planning ground squirrel management.

The method of shooting squirrels most often used is where the hunter positions himself with a good view of the squirrel colony or colonies where he can sit to shoot. Care must be taken so that the line of fire and stray or ricochet bullets do not present a hazard to humans, domestic stock, equipment, etc. One advantage of shooting is that it is not linked to food preference or feeding behavior and thus is most effective if conducted at the period of high squirrel activity just after emergence from hibernation and prior to the time the young are born.

Initially, a squirrel population may not be very gun- or human-shy; but after squirrels are shot at the same site for several days, they become extremely leery. Best results are achieved by working in pairs, with two hunters shooting in unison. This permits two squirrels to be shot with a possibility of each shooter getting a second shot off before the squirrels take to their burrows. The longer shooters remain at a location, the more leery the squirrels become and the longer period it will take for the squirrels to emerge again from their burrows. At first they may emerge in about 10 minutes, but this will soon increase to 20-30 minutes and thus efficiency is greatly reduced. In order for hunting to be effective, it must be sufficiently intense to produce decisive results.

Based upon the squirrel density and terrain, two good hunters using this technique may be able to take 18 to 30 squirrels an hour for about six hours a day when squirrels are most active. Shooting results are generally best in the mornings when the squirrels are hungry and thus less apt to take to cover at the report of a rifle. At 24 squirrels an hour for 6 hours, two hunters would reduce the population by 144 a day, or 72 squirrels per hunter. As the hunting progresses and the squirrels become more gun-shy, the daily take can easily drop to 10 to 20 per man. To calculate shooting costs the squirrel population will be figured at 5 per acre and well distributed over their habitat. Figuring a rather high overall average of 50 squirrels per day per man, it would take the team 50 working days to reduce the squirrels by approximately 90 percent over 1,000 acres. Assuming the hunter received $3.00 an hour and figuring 8 hours a day for an average of 6 hours of hunting with the remaining time used for travel, cleaning of rifles, etc., the hunters would receive $24.00 each per day. This would amount to $0.42 per killed squirrel for labor only. The cost of ammunition at $3.00/100 rounds would raise the cost to slightly over $0.45 per squirrel. Assuming an average of 20 miles per day per team at $0.15 per mile, this would amount to $3.00, adding $0.03 to the cost of each squirrel and utilizing approximately 2 gallons of gasoline per team day.

In order to accomplish effective reductional squirrel control in a relatively short time (i.e., 2 to 3 months), it would probably take somewhere near 89 teams of squirrel hunters on Fort Hunter Liggett. If one crew leader would be necessary for every 15 teams, then 6 crew leaders would be needed for the project. Applying the same wages to the crew leaders as used for the hunters, it would increase the cost per squirrel by $0.016. The final cost per squirrel killed would be approximately $0.466 each; and assuming an average of 5 squirrels per acre for 89,500 acres of suitable habitat on Fort Hunter Liggett, then the total calculated costs for controlling 90 percent of the squirrels on that installation would be $187,681.50. Shooting will not be possible for all the area for various reasons and thus the cost would be proportionately lower.

Comparable cost per squirrel would be anticipated if shooting were to be conducted on Camp Roberts. Because of the lower squirrel population on Fort Ord, the cost per squirrel would be considerably greater as the hunters' take per day is less with lower population.

Shooting will not be possible for all areas (i.e., cantonment and other high human use areas). Shooting would also have to be withheld for various reasons in areas of 89,500 acres (i.e., impact areas) and thus the cost would be proportionately lower. *Likewise, if the squirrels in the* buffer zone only were controlled the acreage of suitable squirrel habitat would be reduced to 27,000 acres and the cost reduced to $56,619. Shooting programs would have to be repeated every 2 or 3 years as the population recovered.

The above costs do not include the cost of 178 rifles (.22 caliber) equipped with a 4-power scope. Each rifle would be approximately $125 for a total of $22,250. The rifle expense could be prorated over 5 to 8 years.

No known squirrel shooting program of this magnitude has ever been recorded in California (or possibly anywhere else); hence the approach on such a large scale would be considered experimental.

The hunters should be trained in the important points of hunting squirrels; they would need a hunting license as prescribed by law. All should be trained in hunting safety. Indifferent hunters who were only interested in live targets could present some hazards to other wildlife. Any careless use of rifles would create some hazards to man.

Sport hunting of ground squirrels has never been successful for effectively reducing their numbers. When the squirrel population begins to be reduced and the squirrels become very gun-shy, the sportsman naturally loses interest and within a year the population returns to its original density.

Because shooting is labor-intensive and restricted to relatively uninhabited areas, it has limited application as a general control method. Therefore, shooting cannot be considered as an important alternative in control of ground squirrels on the Fort Ord complex.

Exclusion. Squirrel-proof fences extending 30 to 36 inches underground, either electric or equipped with a horizontal top flange, have been used to confine or exclude ground squirrel populations (Fitch and Bentley, 1949; Ryckman, et.al., 1953); but because of the animal's ability for climbing and digging, the construction of these fences is very expensive. Except for the protection of a vital structure involving a relatively small area of a few acres, fencing cannot be considered a practical or feasible alternative in ground squirrel control on the Fort Ord complex.

Burrow Destruction. The destruction of burrow systems as a means of reducing reinfestations by ground squirrels on occasion has been suggested and is currently being evaluated for the control of European rabbits (Oryctolagus cuniculus) in Australia (Parker et.al., 1976). Linsdale (1946) stated that periodic destruction of burrows or permanent blockage of entrances was an effective means of retarding or preventing reinfestation. It has also generally been observed that land which has been routinely disced and cultivated for a number of years has fewer squirrels occupying that area than adjacent uncultivated land (Marsh, pers. comm.). However, both of these control methods are predicated on initial elimination of occupants of the colony by some other means. Manual destruction of burrow systems would require considerable manpower and money, and discing would involve major land-use changes, making these approaches impractical for control of ground squirrels on the Fort Ord complex.

Flooding. Flooding can be an effective way to control ground squirrels and prevent reinfestation. Grinnell and Dixon (1918) found that repeated irrigation of an alfalfa field "drowned out" many ground squirrels and prevented their reinfestation. However, use of flooding to control ground squirrels is limited to infestations occurring in crops normally flood irrigated. Considering the hydrology and topography of the area, flooding would not be a feasible alternative in ground squirrel control.

Repelling Devices. At least two magnetic field devices (ERGON, The Frontier House, Spokane, Washington and AMIGO, The VRP Corporation, Los Alamitos, California) have appeared on the market within the last few years. The manufacturers and/or distributors claim the devices will rid an area of ground squirrels, but these claims are unsupported by scientific evidence of efficacy. Until something other than testimonials become available to support their efficacy, these devices cannot be seriously considered as a method of ground squirrel control.

Other types of repellent devices operating on various principles, including ultrasonic sounds, are available for rodent control; however, none of these have been proven effective for ground squirrels or any other rodent species. Therefore, repelling devices cannot be considered a viable alternative in ground squirrel control on the Fort Ord complex.

Biological Control.

Modifications of Grazing. Modifications of livestock grazing have been suggested as a method of reducing ground squirrel numbers (Linsdale, 1946). However, it has been shown that any amount of grazing of California grasslands will encourage ground squirrels to become more abundant (Howard, 1953). Linsdale (1946) found that when grazing was excluded from one small area on the Hastings Natural History Reservation (Carmel Valley, California) ground squirrels tended to decline as the vegetation changed and became rank. According to Fitch and Bentley (1949) and Horn and Fitch (1942) significant reduction of ground squirrels on grazed land would require almost complete exclusion of grazing, which would significantly increase the fire hazard on open range. Furthermore, complete exclusion of grazing at the USFS San Joaquin Experimental Range in Madera County did not eliminate ground squirrels (Howard, pers. comm.). In any event, grazing modification as a tool in reducing the density of ground squirrels should be considered a long-range control measure for open rangeland and will be discussed as such in a later section. Elimination of grazing would not be a feasible alternative, either, for immediate or long-range control of ground squirrels in human use areas or where squirrels damage man-made structures on the Fort Ord complex.

Introduced Diseases. Indirect population reduction through deliberate introduction of fatal or debilitating pathogens is one means of biological control. While biological control has been successful for the control of certain insects and weed pests, it has met with little success in vertebrate pest control. One example frequently cited as evidence of the value of biological control was the introduction of myxoma virus to control European rabbits in

Australia in 1950. Once the disease took hold some remarkable reductions in rabbit numbers occurred in the initial years. However, this did not last due to the development of resistance by the host (Cherrett, et.al., 1971) and attenuation of strains of the virus (Marshall and Fenner, 1960).

Disease organisms which have the potential for adequately reducing populations of vertebrate pests to very low levels unfortunately are rarely host specific and those that are host specific lack effectiveness (Jacobsen, 1962). Once a disease has been released into an ecosystem, man has little if any control over its future effect on the biota. Introduced diseases which are not host specific might severely affect populations of valuable or rare wildlife while having little if any long-range detrimental effect on pest species for which they were introduced.

Since vertebrate pests represent higher animals, man himself might fall victim to an introduced disease intended for pest control. When Salmonella bacteria was introduced many years ago to control rats (Rattus sp.) in the United States, rodent droppings carrying the bacteria then contaminated human food, resulting in food poisoning and human deaths (Storer, 1958).

While the introduction of diseases for control of ground squirrels has been suggested as a natural approach to reducing their density, introduction of the most promising of the known diseases, plague, would be temporary in effectiveness and probably affect only local populations. Of course, the introduction of plague would unquestionably be an unacceptable alternative control method for the ground squirrel problem of the Fort Ord complex, because of the susceptibility of man and other wildlife to this disease.

Predators. The encouragement of natural predators has been suggested as a method for keeping pest rodents at a low level (Craighead and Craighead, 1956; Storer and Jameson, 1965), based on the theory that predators reduce their prey to acceptable levels. Errington (1946 and 1956) provides strong evidence to support the theory that the number of prey determine the number of predators and not vice versa. Howard (1974) theorizes that predators may in fact keep certain prey at higher levels than would persist over long periods of time if predators were not present, even though such prey populations would initially increase following removal of any predators. Depending on the species involved and the situation, all theories may be valid. Insofar as ground squirrel populations are concerned, no

definite evidence exists that predators, native or introduced, are capable of keeping squirrel populations at or below levels considered acceptable on the basis of public health or economic damage. Howard (1953) stated that coyotes take only a fraction of the annual increase in ground squirrels and that the combined influence of all predators could not keep squirrel populations at low levels. Current knowledge does not support the practicality or feasibility of either introducing additional predators or attempting, by artificial means, to increase the density of the existing population and therefore should not be considered a practical alternative for ground squirrel control in the Fort Ord complex.

Summary. Of the methods of ground squirrel control described on the previous pages, many were deemed impractical for immediate control of ground squirrels on the Fort Ord complex, either in large-scale or limited use. Table 12 analyzes some of these methods as to their efficacy, adverse environmental effects, cost, and feasibility in large-scale or limited use. Those methods of ground squirrel control that were judged to be practical for large-scale or limited use on the Fort Ord complex are summarized in Figure 32 and will be further discussed in following sections.

Methods of Flea Control

Carbaryl (Sevin). Carbaryl (Sevin) is a white crystalline carbamate poison. It is slightly soluble in water. Carbaryl is used primarily to control insect pests on fruit, vegetables, forage crops, field crops, lawns, ornamentals, and other crops as well as on poultry and humans. It is available in the form of 5 or 10 percent dust, 5 or 10 percent granules, wettable powder, oil dispersion, and water dispersible.

Carbaryl is a relatively fast-acting contact or stomach poison. A wide number of insects are susceptible. Bees are highly susceptible (Thomson, 1976). In field studies carbaryl has been shown to be highly toxic to aquatic invertebrates and some molluscs (California State Water Resources Control Board, 1971; U. S. Office of Science and Technology, 1971). Carbaryl may also lower natural resistance in fish to parasites (U. S. Office of Science and Technology, 1971). Mammals and birds show low toxicity to carbaryl (Tucker and Crabtree, 1970; California State Water Resources Control Board, 1971).

Carbaryl reportedly has no effect on plants (U. S. Office of Science and Technology, 1971). However, it may cause retarded germination of grasses or injury to young foliage (Thomson, 1976). According to the 1975 Farm Chemicals Handbook (Meister Publishing Company, 1975) use of carbaryl in the field does not result in excessive residues. Residues have been found to dissipate rapidly (U. S. Office of Science and Technology, 1971).

Table 12

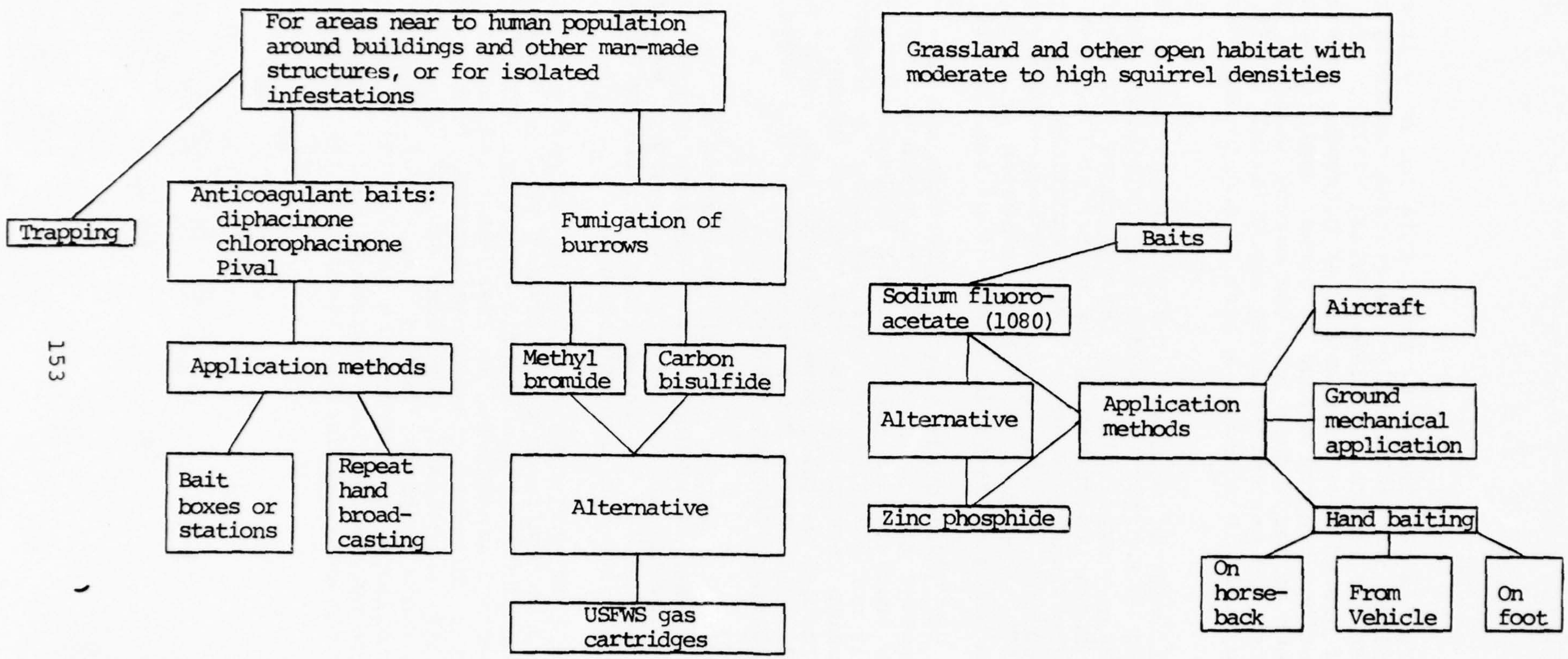
Analysis of Some Alternative Methods of Ground Squirrel Control

Methods	Effectiveness in alleviating the problem	Adverse environmental effects	Cost	Feasibility: Large-scale use	Feasibility: Limited use
Trapping	H	L	H	L	H
Shooting	H	L	H	L	M
Exclusion	H	L	H	L	L
Chemical repellents	U	U	H	L	L
Repelling devices	U	U	H	L	L
Other fumigants	L to H	L	H	L	M
Chemosterilants	U	U	U	U	U
New rodenticides	U	U	U	U	U
Predators	U	U	U	U	U
Introduced diseases	U	U	U	U	U
Modification of grazing	U	L	U	U	U
Burrow destruction (cultivation)	M	U	H	L	M
Flooding	M	L	H	L	M

L = low, M = medium, H = high, U = unknown.

Figure 32

PRACTICAL METHODS OF SHORT-TERM GROUND SQUIRREL CONTROL ON THE FORT ORD COMPLEX*



* All suggested methods are subject to various limitations (i.e., safety, efficacy, timing, cost, etc.)

Carbaryl is registered by California for many insects including fleas and is the only insecticide currently registered by EPA for control of fleas (Nelson, 1976). For control of fleas of ground squirrels and other burrowing rodents, the most efficacious control method is direct application of 5 or 10 percent carbaryl dust into the burrow (Nelson, 1976). Carbaryl dust (10 percent) costing approximately $0.50 per pound is normally injected at a rate of one to two ounces per burrow.

The efficacy of carbaryl in flea control may be variable. According to Nelson (1976) field use in California has failed to effectively control fleas in several cases. Other field tests have shown reductions in the number of fleas per squirrel, but it is questionable whether these reductions signify effective control (Nelson, 1976). More recent summaries (Barnes, 1977; Johnston, 1977) have indicated effective flea suppression using carbaryl (see Page 86 of this report).

DDT. DDT (dichlorodiphenyltrichloroethane) is a white amorphous powder that is used as an insecticide. It is practically insoluble in water, dilute acids, or alkalis. It is extremely non-volatile and does not normally decompose in sunlight, which results in its high residual powers. It has been used as aerosols, wettable powders, solutions, emulsions and as a dust (California State Water Resources Control Board, 1971; Meister Publishing Company, 1975).

DDT became a popular contact insecticide in the United States during and after World War II because of its high toxicity to insects and relatively low hazard to warm-blooded animals. However, it was later found that DDT could accumulate in the fatty tissues of many organisms.

Research on the effects of DDT in the past years has shown that 1) DDT affects phytoplankton species composition and the natural balance in aquatic ecosystems, 2) DDT can be concentrated and transferred in freshwater and marine plankton, insects, molluscs, other invertebrates, fish, terrestrial invertebrates, amphibians, reptiles, mammals, and birds, 3) DDT can be toxic to birds, fish and many useful aquatic invertebrates, molluscs, and arthropods and 4) DDT affects the reproductive success of many species of fishes and birds (U. S. Environmental Protection Agency, 1975).

As a result of this extensive research into DDT's residual effects, general use of DDT in the United States was cancelled by the Environmental Protection Agency in 1973. Even though DDT is still used in this country in emergency public health cases or in other situations permitted on a case basis (U. S. Environmental Protection Agency, 1975), under the present circumstances, DDT cannot be considered a viable method of flea control for the Fort Ord Complex.

Other Insecticides. Other insecticides that are effective in flea control include phoxim, trichlorfon (Dipterex), dichlorvos, dieldrin, malathion, and diazinon. Phoxim and trichlorfon are organic phosphate insecticides with systemic properties. Dichlorvos, also an organic phosphate, is a vapor toxicant (fumigant). However, all three insecticides are still under experimentation and are not currently registered with EPA for flea control (Nelson, 1976). Dieldrin, a chlorinated hydrocarbon insecticide similar to DDT has also shown long residual effects and is no longer sold or used in the United States (Thomson, 1976). Malathion and diazinon are organic phosphate insecticide-acaricides that are primarily used in California for mosquito control (California State Department of Health, 1976).

Surveillance, Monitoring and Testing

If a ground squirrel control program is undertaken at the Fort Ord complex, a surveillance and monitoring plan should be prepared and implemented. The objective of the plan should be to collect information on the results of the control effort. It should be oriented toward the collection of data which could be used to improve future control efforts either at the Fort Ord complex or elsewhere.

The details of the surveillance and monitoring program will be dependent on the specific control methods implemented. The following are examples of the type of measurements which should be made:

1. The efficacy of the control method applied. What percent of the ground squirrels (and fleas) were killed?

2. The effects of the control method on nontarget species, with special emphasis on rare and endangered species.

3. The rate and timing of re-population (or reinfestation) by ground squirrels following control.

The EPA study, now underway in Tulare County, will attempt to obtain most of this information (see Appendix J).

The Fort Ord complex has been designated in a memorandum from the Office of the Adjutant General, 3 December 1976, as an installation sufficiently at risk to warrant major (plague) surveillance. A number of surveillance elements are to be conducted including:

1. Carnivore Blood Serum. Collect and submit 25 to 30 carnivore (coyote, bobcat, fox, raccoon, etc.) blood serum samples during the period February, March and April each year.

2. Rodent and Flea Population Characterization. Develop baseline data on species and densities of rodents and fleas potentially involved in plague transmission and determine the degree of human contact with such populations. Evaluate population densities at least annually, where highly susceptible rodent species (rock squirrel, beecheyi ground squirrel, and prairie dog) occur.

3. Rodent Population Observation. Where highly susceptible rodent species occur, observe rodent populations for unusual conditions (sick, sluggish or dead animals) that may signal disease activity. Observations should be accomplished at least twice monthly when rodents are active (i.e., when the mean temperature exceeds 40°F).

4. Liaison Activities. Establish and maintain liaison with local and state health authorities to ascertain any potential plague activity in proximal civilian areas.

5. Epizootic Investigation. When unusual activity or dead animals are observed in the rodent population, or when plague activity is determined by carnivore blood serum analysis, an epizootic investigation will be initiated. (As a minimum, investigations should include the collection of dead animals, trapping rodents for sera and flea collections, and swabbing burrows for fleas).

Consideration should also be given to the testing of changes in existing land use practices to determine their long term benefits in controlling ground squirrel populations or reducing potential ground squirrel damage and, incidentally, to determine their contribution to improved management of the natural resources of the three military installations.

It would be desirable to establish one or more test areas on which the grazing intensity could be adjusted to determine the effect this would have on ground squirrel numbers. The literature is not conclusive on the relationship between grazing and ground squirrel populations. If a practical study of this nature were devised, it should be coordinated carefully with the study planned by the Sacramento District Corps

of Engineers for the preparation of a range and related resource inventory and condition report for Fort Hunter Liggett by Dr. John Menke, University of California, Davis.

There are conflicting opinions concerning the relationship of ground squirrels to grazing and range condition. Therefore, no recommendations are made as to the extent to which grazing could or should be controlled in order to limit ground squirrel populations. It is recognized and evidence is provided that grazing and human disturbances of the soil do in some situations favor higher squirrel numbers. There is no evidence that the exclusion of livestock, without the exclusion of man and his equipment, will have any change on the squirrel population.

The range study design should include an investigation of the role of the ground squirrel with respect to grazing, particularly whether there is a level of grazing and subsequent range condition which will result in reduced ground squirrel population.

Consideration should also be given to testing various habitat modification methods and their efficacy in minimizing or preventing damage. The possibility of establishing a buffer strip of land which is frequently disturbed by mechanical means on the perimeter of military lands to minimize ground squirrel damage to adjacent private landowners has been mentioned. The practicability of these or other approaches should be further considered. If any appear feasible, they should be tested at an appropriate site.

Regardless of what surveillance monitoring and testing is undertaken, it is essential that a system be developed and implemented for the collection and recording of ground squirrel damage and all of its associated costs -- both prevention and control.

Categories of Areas to be Treated

The Army's proposed ground squirrel and flea control program can be divided into three categories: 1) control in open rangeland, 2) control in areas of human use and 3) control in special areas (i.e., dam faces, around water supplies and in the vicinity of any known San Joaquin kit fox den sites) (Figures 5 through 10).

The Proposed Action

Objective

The objective of the proposed action is to reduce ground squirrels and their fleas to acceptable levels, which in turn will reduce 1) the human health hazards, 2) crop and range depredation, 3) damage to military structures and interference with military activities.

Objectives of Various Interests Regarding the Proposed Action

The control of the ground squirrel population at the Fort Ord complex has aroused the interests of many. They include governmental agencies at the federal, state and local level, individual citizens (both locally and nationally), and a number of local and national citizen organizations. Their concerns about this project differ -- primarily because as a governmental agency, they have certain assigned responsibilities; or, if a citizen's organization, their organization has a specific set of goals or objectives.

This section lists what appear to be the major interests and objectives of the key groups. A consideration of these various objectives has value in evaluating the impacts and to assist in selecting the proper course of action to take in ground squirrel control at the Fort Ord complex.

Army. The Army as land manager of the three military reservations has the major responsibility for the areas. The primary use of these areas is to further the military mission, in addition, Army Regulation 200-1, Environmental Protection and Enhancement, lists additional environmental objectives:

> It is the continuing policy of the Department of the Army, as a trustee of the environment, to demonstrate leadership and carry out its mission of national security in a manner consistent with national environmental standards, laws and policies. All practical means and measures will be used to minimize or avoid adverse environmental consequences and in attaining the objectives of --
>
> (1) Providing a safe, healthful, productive, and esthetically and culturally pleasing surrounding.
>
> (2) Attaining the widest range of beneficial uses of the environment without degradation, risk to health or safety or other undesirable and unintended consequences.

(3) Preserving important historic, cultural, and national aspects of our national heritage and maintaining where possible an environment which supports diversity and variety of individual choice.

(4) Achieving a balance between resources use and development within the sustained carrying capacity of the ecosystem involved.

(5) Enhancing the quality of renewable natural resources and approaching the maximum attainable recycling of depletable resources.

The land use relationship section of the report lists numerous other laws and regulations which provide guidance or constraints on the use of these lands (i.e. Endangered Species Act, Historic Preservation Act, etc.). In addition, certain programs are implemented on the areas by the army to satisfy or support one or more of the objectives (i.e. grazing use of the installations assists in fire control -- a necessity in furthering the military mission).

Local Landowners. The major interest of many landowners adjacent to the three installations or the local ranchers who lease grazing rights on the reservations is to earn their living by grazing cattle or sheep or growing crops. High ground squirrel populations affect these objectives.

Public Health Officials. The public health officials at the federal, state and local government level are interested primarily in protecting public health and preventing a plague epidemic due to fleas on ground squirrels. The higher the ground squirrel/flea populations the greater is the threat of plague incidence.

Fish and Wildlife Officials. Both federal and state fish and wildlife agencies are responsible for the protection of important fish and wildlife populations and are particularly concerned with the potential impact of ground squirrel control programs on endangered and threatened species.

Citizen Environmental/Conservation Organizations. Although specific areas of interest of the different groups vary, most are interested in the maintenance and long-term protection of natural resource values including fish and wildlife.

Humane Groups. Most humane group's key objectives are the maintenance of all animal populations. Some are opposed to the killing of animals by any means. Others oppose what they consider indiscriminate killing or killing by inhumane methods.

Description of Treatment and Application Methods

Open Range. The proposed action for control of ground squirrels in open rangeland of the Fort Ord complex involves the use of sodium monofluoroacetate (1080) and zinc phosphide grain bait. Compound 1080 will be used in 1977 on Fort Hunter Liggett and Camp Roberts and zinc phosphide will be used on Fort Ord. Widespread, direct flea control with insecticides is not being considered for the open range, since flea control is ultimately achieved through squirrel reduction.

Sodium Monofluoroacetate (1080). Sodium monofluoroacetate, purchased from Kings County Agricultural Commissioner, will be used in the form of grain bait (crimped oat groats) with a 1080 concentration of 0.08 percent. The bait will contain a yellow dye (Auramine O concentrate 130 percent) to repel seed-eating birds. Prior to application of poison bait, bait acceptance will be tested in several squirrel colonies using untreated crimped oat groats.

Application of 1080-treated grain bait will be by aircraft only. The Monterey and San Luis Obispo County Departments of Agriculture will serve in an advisory capacity for the application of the poison bait. All procedures concerning proper conditions for application, notification of adjacent landowners, pilot safety, handling, cleanup and disposal of poison and its containers will be governed by California Department of Food and Agriculture laws and regulations.

On squirrel-infested rangeland bait will be applied by spot broadcasting from aircraft, by pilots trained in ground squirrel control, over isolated, active colonies at a rate of 6 pounds/swath acre. Grazing lessees on both installations will be notified prior to the aerial application of 1080 bait. Retreatment with aerially-applied 1080 bait may be required every 2-3 years, wherever the ground squirrel populations increase again to a high density.

Approximately 89,500 acres of the total of 166,535 acres on Fort Hunter Liggett can be assumed to be potential open range ground squirrel habitat (i.e., grassland and oak grassland vegetative cover types). Of the 89,500 acres, it is estimated that only about 5 percent* of this acreage (4,475)

* Figures of 2.4 and 3.7 percent have been reported from Monterey and San Luis Obispo Counties and cited earlier. Five percent is used as a conservative estimate because of the high squirrel density.

acres) is active colony area and will actually be treated with 1080 bait. Therefore, the estimated pounds of 1080 bait spot-broadcasted at a rate of 6 pounds per acre (i.e., 6 pounds/swath acre), where applied, totals 26,850 pounds. At $0.25 per pound, the 1080-treated bait will cost $6,712. Assuming that a pilot can fly an average of 1,500 acres per hour (Marsh, 1968), approximately 60 hours of flying time will be needed to cover all of the potential ground squirrel habitat. At a maximum of $150 per hour of flying, the total cost of the pilot and aircraft will be $9,000. Excluding any supervisory costs, the estimated total cost of aerial application with 1080 bait on Fort Hunter Liggett will be $15,712 or $0.17 per acre.

Approximately 39,000 acres of the total of 43,745 acres on Camp Roberts are potential ground squirrel habitat. Of these acres, however, only approximately 1,950 acres is active colony area and will be treated. The estimated pounds of 1080 bait needed at 6 pounds per swath acre is 11,700, which at $0.25 per pound will cost $2,925. Twenty-six hours of flying time will be needed to fly all potential ground squirrel habitat and will cost $3,900. Excluding any supervisory costs, the total cost of 1080 aerial application on Camp Roberts will be approximately $6,825 or $0.17 per acre.

Post-treatment manpower for retrieval of squirrel carcasses above ground will be supplied by army personnel. Handling and disposal of carcasses will follow California Departments of Food and Agriculture and Public Health recommendations. Military operations will be notified wherever aerial application of 1080 bait is being conducted.

Zinc Phosphide (Zn_3P_2). Zinc phosphide grain bait with a poison concentration of 0.8 percent will be purchased through the Monterey County Agricultural Commissioners office. The bait will contain a bird repellent dye. Bait acceptance will be tested prior to application of poison bait.

Army personnel will apply the poison bait on Fort Ord by hand wherever squirrel colonies exist on the open rangeland. Distribution of the bait by hand will follow label instructions (one level tablespoon scattered around each burrow to cover 2 to 3 square feet). All handling and cleanup of poison bait and its containers will follow California Department of Food and Agriculture recommendations. The grazing lessee will be notified before application of poison bait.

Approximately 11,000 acres of Fort Ord is potential ground squirrel habitat. The estimated amount of zinc phosphide needed to hand treat the isolated squirrel colonies within this acreage is 2,310 pounds. Depending on the density of squirrels and number of burrows per acre, when hand baiting, a maximum of 1 pound of zinc phosphide-treated bait may be

needed per acre. At $0.30 per pound, the zinc phosphide grain bait will cost approximately $693. An estimated 19 man days will be needed to hand treat squirrel-infested areas, but because labor will be supplied by Army personnel, no estimates of labor costs have been prepared.

Zinc phosphide is also projected for use as a long-range control measure on all three installations. After aerial application of 1080, it will be used whenever needed throughout the year on Fort Hunter Liggett and Camp Roberts, and in other untreated areas that have squirrel damage, such as road banks and culverts. Any treatment after the aerial application will be preceeded by bait acceptance trials.

Areas of Human Activity. The proposed ground squirrel and flea control program for areas of human activity on all three installations (i.e., cantonments, bivouacs, recreational areas) may involve use of several rodenticides: diphacinone, methyl bromide, carbon bisulphide, gas cartridges, and zinc phosphide. In addition, carbaryl will be used to control fleas within human use areas.

Squirrel Control. Diphacinone grain bait will be the most extensively used rodenticide within human use areas. It will have a poison concentration of 0.005 percent. Bait will be distributed in 30-inch long PVC pipe bait boxes with the bait boxes no further apart than about 200 feet in infested areas. Approximately 8 pounds of bait will be used per bait box. Diphacinone grain bait will cost $0.30/pound. The cost of construction of each bait box is estimated to be $5.00. Bait boxes will be maintained for a period of 21 days or until consumption ceases. The bait will be replenished as needed which, initially, will be every 2 to 3 days.

On Fort Ord there are an estimated 500 acres to be treated. Approximately 400 pounds of diphacinone and 50 bait boxes will be needed. The total cost will be $370 for bait and boxes, excluding labor costs.

On Camp Roberts, 3,000 acres will be treated. A total of 3,200 pounds of diphacinone bait and 400 bait boxes will be needed. The total cost will be $2,960 for bait and boxes, excluding labor costs.

On Fort Hunter Liggett, 3,000 acres will be treated. A total of 3,200 pounds of diphacinone bait and 400 bait boxes will be needed. The cost will be $2,960 for bait and boxes, excluding labor costs.

Safety precautions for handling, cleanup, and disposal of bait-contaminated containers and carcass disposal will follow the recommendations of the California Departments of Food and Agriculture and Public Health. Army personnel and civilians will be notified when treatment begins.

Fumigants, such as methyl bromide, carbon bisulphide and gas cartridges will be used by Army personnel in conjunction with diphacinone in human use areas of each installation. All fumigants will be applied following recommended rates and procedures on the rodenticide label. Army personnel will follow California Department of Food and Agriculture regulations when handling or disposing of poison containers. There will be limited use of fumigants and costs will be minimal.

A limited amount of zinc phosphide grain bait will be used within city limits of Fort Ord on the athletic field or in vacant lots. It will not be used near family housing or other inhabited buildings.

Flea Control. As per U. S. Army Surgeon General recommendations, fleas of ground squirrels will be controlled in the cantonments or other human use areas. Ten percent carbaryl dust purchased from the manufacturer will be applied by Army personnel using appropriate dusters. Two ounces of dust will be injected into each burrow. Safety precautions, handling and disposal of poison containers will follow label instructions.

Acreages and burrows to be treated on all three installations are equivalent to those estimated for diphacinone treatment. Five hand dusters at $25 each and 200 pounds of carbaryl at $0.50 per pound will be needed for treatment on Fort Ord. The total cost will be $225. Fifteen hand dusters and 1,500 pounds will be needed on Fort Hunter Liggett. The total cost will be $11,125. Fifteen hand dusters and 1,500 pounds of carbaryl will be used on Camp Roberts. The total cost will be $1,125.

Areas of Special Concern. Ground squirrel control in areas of special concern such as den sites of San Joaquin kit fox, water supplies, and dam faces will be more restrictive. Prior to open rangeland treatment an inspection will be made on each installation for den sites of the San Joaquin kit fox in conjunction with the California Department of Fish and Game. If den sites are found, 1080 bait will not be distributed within a one-mile radius; only zinc phosphide will be used in the vicinity of kit fox dens. In other sensitive areas such as dam faces or water supplies, infestations will be treated with diphacinone or the previously mentioned fumigants. Use of rodenticides in these special situations will be limited and costs will be minimal. Carbaryl will be used if there is significant human use of any of these areas.

Since the so called "open-range" may contain any one or several of the areas of human use or of special concern, applications of specific squirrel or flea control chemicals may be necessary at specific sites within this open range area. From the viewpoint of the Surgeon General's office, if ground squirrel control in any area is conducted without preceding or concurrent flea control, there should be a quarantine upon activities of the military or the public (including pets) within the treated areas. The following actions are proposed for training areas on "open range" where burrow dusting is impractical.

1. Use carnivore serum data generated from the DA Plague Surveillance Program to determine potential plague activity in the rodent population. Insure that a minimum of 25 carnivores having a limited home range (e.g., badgers, raccoons, skunks, and feral house cats) are collected from squirrel infested training areas.

2. At random, swab a minimum of 200 beechey ground squirrel burrows from each separate training area. Collect and pool fleas from each training area by placing in a vial containing 2 percent saline solution. Forward labeled vials to the Plague Branch, CDC, Fort Collins, Colorado for plague isolation.

3. If the carnivore serum does not demonstrate significant plague titers and the flea pool from individual training areas are negative, the following measures are proposed to minimize plague vector (flea) exposure in squirrel-poisoned training areas without flea control.

   (a) Allow training maneuvers, including foot traffic; however, personnel should not be allowed to sit or lie on or near squirrel burrows.

   (b) Require personnel to apply insect repellent to clothing around the collar, waist, sleeve ends, and trouser blousing.

   (c) Allow bivouacking only in squirrel-free areas or areas where burrows have been dusted with carbaryl dust. As a margin of safety a one-fourth mile buffer zone around the bivouac area should be dusted.

   (d) Dust burrows around established "foxholes".

4. In training areas where flea pools are positive or suspected of supporting an active plague epizootic, either from significant carnivore serum plague titers or unusual rodent activity, quarantine is indicated until flea control can be accomplished.

5. In plague-positive training areas where flea control is not practical nor feasible, plague immunization may be a last resort alternative.

Impacts and Mitigations of Chemicals and Control Methods

In the discussion of impact and mitigation measures this report has proceeded on the assumption that the proposed action and alternatives will be conducted according to the laws, regulations, policies and permit constraints which will be imposed by the appropriate federal, state and local government agencies. See Appendix G for selected guidelines and constraints extracted from the California Administrative Code, the California Food and Agriculture Code, and the Vertebrate Pest Control Handbook.

Rodenticide bait will be formulated and used in accordance with the recommendations of the California Department of Food and Agriculture. All materials will be used following the most recently approved label instructions.

Time-proven policies and procedures have been assembled for conducting squirrel control. These incorporate many working details aimed at maximum efficacy on the target species and a minimum of undesirable effects under California field conditions (California Department of Food and Agriculture, 1975). All chemical control methods will be conducted under the advice of the appropriate county agricultural commissioner.

Insecticides for flea control will be used in accordance with label instructions and following the recommendations provided by health officials for maximum efficacy and a minimum of undesirable effects.

Open Range

Water Resources. There is little possibility of 1080 (sodium monofluoroacetate) entering the aquatic environment from watershed runoff, leaching to the groundwater or accidental application onto water bodies. According to Saito, et.al. (1966), Hilton, et.al. (1969) and Peters (1975), sodium monofluoroacetate leached from baits is not likely to

be carried far, but rather to remain adsorbed in the upper soil (Atzert, 1971). Saito, et.al. (1966) analyzed water for a 5-month period from streams in an area treated with 1080 and did not detect a trace of the chemical. This suggests that the toxic effects on waterfowl will be negligible. See Table 13 for LD_{50}s for selected waterfowl. As a standard operating procedure, 1080 applied aerially or by hand will not be applied closer than 100 feet from streams or reservoirs. Any aerially-applied 1080 on Hunter Liggett and Camp Roberts will be at the rate of 6 pounds of baited grain per acre. The 1080 will be mixed at the rate of 0.015 ounce (0.425 grams) per pound of grain. Assuming the application of 1080 on one acre of watershed in the amounts previously mentioned, it is possible to project the potential contamination of a water resource with 1080. For the purposes of this example, it was assumed that: (1) 2.6 grams of 1080 was distributed evenly over one acre, (2) that rainfall equalled one inch, all of which ran off, (3) the entire toxic load is translocated (leached) from the grain baits into an impoundment or other water body. Given those assumptions, there would be 0.025 mg of 1080 per liter leached into the water body (Peters, 1975). Such an event is unlikely due to the tendency of 1080 to remain adsorbed in the soil layer and plant cellular material, and because the aerial application will be conducted in May or June, a time when the majority of precipitation has ceased. The lethal dose (LD_{100}) of 1080 for man is 2 mg/kg of body weight. Assuming a body weight of 70 kg (154 pounds), it would be necessary for a man to drink 5,600 liters (6,000 quarts) of the contaminated water within half a day to receive a lethal dose (140 mg/l). The effects of minute doses of 1080 in man over a period of time is unknown, although 1080 is known to be eliminated by the body. Long-term studies in rats suggest that effects are few (Miller and Phillips, 1955).

The expected life of 1080 in water is unknown; however, there is evidence that sodium monofluoroacetate would degrade into nontoxic components at the soil/water interface due to the activities of soil micro-organisms (Peters, 1975; David and Gardner, 1966).

While there is always the possibility of an accidental spill of 1080-baited grain into a water body, it would take a concentration of >370 mg/l to have an effect on fish life (King and Penfound, 1946).

Zinc phosphide (Zn_3P_2) is insoluble in water, and therefore is not expected to provide any significant impact <u>per se</u> upon water quality in the proposed treatment area. Zinc phosphide breaks down by hydrolysis in damp, acid situations releasing zinc ions and phosphine gas (PH_3), both of which may affect water quality. Phosphine gas is converted rapidly to phosphates in the soil, and in water solution would be utilized by living organisms.

Zinc has no known adverse physiological effects upon man except at very high concentrations, and is an essential and beneficial element in human nutrition (discussed and referenced in California State Water Resources Control Board, 1971). As discussed in this publication, it would appear that the USPHS and World Health Organization (WHO) limits of 5 mg/l of zinc in drinking water are conservative. The normal human intake of zinc is estimated to be 10-15 mg/day with numerous reports of families and communities using drinking water containing up to 50 mg/l. 30 mg/l of zinc may cause a milky appearance in water and an unpleasant taste may be present as low as 2 mg/l.

In the unlikely event that all of the zinc phosphide bait added to one acre were to become hydrolyzed and all of the zinc washed into an impoundment by 1 inch of rain (102,790 liters), the resulting concentration of zinc due to this addition would be 0.34 mg/l. (Based upon the rate of 6 pounds of zinc phosphide-treated bait per acre using a 1.69 percent formulation, this would result in 0.1014 pounds of zinc phosphide per acre. Of this $\frac{3(65.4)}{258.1} \times 0.1014$ pounds or 0.0771 pounds would be as zinc ions. 0.0771 pounds = 35 grams of zinc. $\frac{35 \text{ grams}}{102{,}790 \text{ liters}} = 0.34$ mg/l.)

Even if no further dilution occurred, which is unlikely -- either through removal of the zinc ion by chemical or biological processes (there is evidence that zinc ions are adsorbed strongly and permanently on silt with a resultant inactivation of zinc [Jacobs, 1955, In: California State Water Resources Control Board, 1971]), or by addition of more water -- this concentration remains far below the recommended upper limit for zinc in livestock waters of 25 mg/l.

Fauna - Sodium Monofluoroacetate (1080).

Primary Poisoning - Target Species. Sodium monofluoroacetate (1080) as a rodenticide has had a long, effective and relatively hazard-free history in squirrel control in California. It is the most efficacious, acute rodenticide known for squirrel control (Dana, 1962; Marsh, pers. comm.; Howard, pers. comm.), but 1080, like all toxicants, has some undesirable characteristics which may result in some degree of unfavorable impact.

The spot-broadcast application of compound 1080 by aircraft on Fort Hunter Liggett and Camp Roberts will result in relatively high mortality (approximately 90 percent) of the Beechey ground squirrels. The degree of control (mortality)

may depend on several factors: (1) the timing of the control operation in relation to the above-ground activity of the squirrels (discussed earlier), (2) bait acceptance as may be influenced by feeding habits and the availability of more preferred natural food, (3) the density of organic litter or range forage on areas where bait is applied, which influences the squirrels' ability to locate a lethal amount of bait (applied at about 2.5 kernels of grain per square feet, i.e., 6 pounds per swath acre), (4) the ability of the pilot to place bait in close proximity to squirrel burrows.

If 1080 bait prepared on crimped oat groats at the concentration of 0.08 percent (1.5 ounce per 100 pounds of grain) is applied by spot broadcasting from the air at a rate of 6 pounds of grain per swath acre treated, the percent mortality will probably be approximately 90 percent. Figures of 85 to 98 percent have been mentioned (Marsh, 1968; Kalar, pers. comm.). The actual effectiveness of control will have to be determined through pre- and post-treatment censuses of representative areas.

The effect of the control operation will be an immediate reduction of the squirrel populations receiving treatment on Fort Hunter Liggett and Camp Roberts. Populations in areas not treated will continue to exist and may act as a source of reinfestation of the voids created by control, and they may also move into new areas previously unoccupied by squirrels if favorable habitat has been created.

After the initial treatment, ground squirrel populations will remain low until production of young the following spring. The rapidity with which the population recovers depends on the initial degree of control. Ninety percent mortality initially may keep the population suppressed for 2 or more years before retreatment may be necessary. Subsequent control with 1080 or other methods can be used to maintain a depressed population.

Primary Poisoning - Nontarget Species. Primary poisoning can be defined as poisoning which may result when the toxic bait is ingested directly by nontarget species. Whether this, in fact, takes place under field conditions depends on many factors.

The timing of squirrel control is relatively critical for maximum efficacy. Squirrel control conducted at the optimum time of year with the most efficacious rodenticide will then reduce the need for frequent rebaiting, reducing the overall amount of 1080 placed in the environment and, hence, reducing the degree of potential exposure to nontarget species.

The relatively limited optimum baiting period (discussed earlier) assists in anticipating potential problems which may arise as the result of baiting. Baits for aerial and hand baiting are formulated with the minimal concentration of rodenticide effective for the target species, and this markedly reduces the potential hazard to many nontarget species, especially those less susceptible to 1080 than are squirrels. Ground squirrels are among the most susceptible of all species to 1080, with an LD_{50} of about 0.3 mg/kg (Table 13), and this is probably the key factor that has kept impacts on the environment resulting from ground squirrel control at such a relatively minor level.

The potential of primary poisoning of nontarget species depends on (1) whether such animals find and consume the bait, (2) the susceptibility of the species to 1080, and (3) the ability of the species to detect early symptoms and stop feeding prior to ingesting a lethal dose (aversive conditioning).

To reduce the potential hazards to nontarget species, baits are prepared with recleaned crimped (slighted rolled) hulled oat groats which, according to Marsh (pers. comm.) and Howard (pers. comm.), are selected for a number of reasons:

1. Oats are highly preferred by squirrels, but are less acceptable to small seed-eating birds than are other grains such as wheat (Gabrielson, 1932) or milo.

2. Rolling of the oat groat kernel distorts its shape, which is believed to cause additional rejection by birds.

3. Rolling increases the surface areas, making them relatively consistent in size, permitting even distribution of the toxicant on the grain, thus decreasing the chance that some kernels might have much greater concentrations of toxicant than others.

4. Oat groats are consumed at a faster rate than oats with hulls because the squirrels do not have to stop to hull the oats. This increases the efficacy of the bait, permitting a lower application rate.

5. Biological and climatic degradation of the rolled oat groats is much more rapid than with unhulled oats or oat groats which are not rolled.

6. Baits using hulled oats can be prepared at slightly reduced rodenticide concentrations without affecting efficacy because no toxicant will be lost in the squirrel's hulling process. Hulls discarded by squirrels contain small amounts of toxic residue.

Table 13

LD_{50} OF SODIUM MONOFLUOROACETATE (1080) FOR WILD AND DOMESTIC VERTEBRATE SPECIES

Species	LD_{50} mg/kg	Average Weight, kg	Median Lethal Dose Required, mg LD_{50}
MARSUPIALS:			
Opossum	<1.2	3	3.6
UNGULATES:			
Cow, adult	0.393	500.0	196.5
Cow, juvenile	0.221	--	--
Goat	0.6	50.0	30.0
Horse	0.35-0.55	--	--
Mule	0.22-0.44	--	--
Sheep	0.25-0.50	50.0	12.5-25.0
Pig, adult	<1.0	50.0	50.0
Pig, juvenile	0.4	--	--
Mule deer	0.30-1.0	68.0	20.4-68
CARNIVORES:			
Bear	0.5-1.0	136.0	68.0-136.0
Bobcat	<0.66	10.0	<6.6
Domestic cat	<0.20	1.4	<0.3
Mountain lion	Unknown		
Coyote	0.10	13.6	1.4
Gray fox	<0.3	5.4	<1.6
Desert kit fox	0.22	1.7	0.4
Dog	0.1	25	2.5
Badger	1.0	8.6	8.6
Marten	~1.0	1.4	~1.4
Mink	~1.0	1.4	~1.4
RODENTS:			
Columbia ground squirrel	0.1	0.5	0.1
Fisher's ground squirrel	0.3	0.9	0.3
Breviceps pocket gopher	<0.05	0.3	0.02
Southeastern pocket gopher	0.25	0.3	0.08
Merriam kangaroo rat	<0.2	0.04	0.008
Fresno kangaroo rat	--	0.04	--
Norway rat	4.0	0.3	1.2
Wood rat	1.5	0.4	0.6
Black rat	0.5	0.2	0.1
Deer mouse	4.0	0.02	0.08
House mouse	8.0	0.01	0.08
Pocket mouse	--	0.02	--
Meadow vole	0.92	0.04	0.04
Porcupine	<1.0	5.4	<5.4
LAGOMORPHS:			
Black-tailed jackrabbit	5.55	2.3	12.8
BIRDS:			
Domestic pigeon	4.24	0.3	1.3
Mourning dove	7.8	0.2	1.6
Mallard	6.1	1.2	7.3
Pintail	8.0	1.0	8.0
Widgeon	7.5	0.8	6.0
Snow geese	3.5	2.7	9.5
White-fronted geese	5.9	2.8	16.5
Chicken	7.5	1.0	7.5
Chukar	3.51	0.5	1.8
Gambel's quail	20.0	0.3	6.0
Japanese quail	17.7	0.2	3.5
Ring-necked pheasant	6.46	2.5	16.2
Turkey	4.0	3.0	12.0
California quail	2.6	0.2	0.5
Brewer's blackbird	2.0-3.0	0.2	0.4-0.6
English sparrow	3.0	0.1	0.3
Golden eagle	1.25-5.0	3.2	4.0-16.0
Rough-legged hawk	~10.0	1.1	~11.0
Marsh hawk	~10.0	1.1	~11.0
Great horned owl	~10.0	1.6	~16.0
Turkey vulture	<20.0	2.7	<54.0
Magpie	0.67	0.23	0.15
California condor	Unknown		
MAN:	2	68.0	136.0

Source: Atzert, 1971; Peters, 1975; California Department of Food and Agriculture, 1975.

7. Rolled oat groats will not germinate, eliminating any chance of toxic seedlings.

Laboratory studies have indicated that most seed-eating birds are less susceptible to 1080 than are ground squirrels or canids (Rudd and Genelly, 1956; Tull Chemical Company, n.d.; Atzert, 1971; Peters, 1975; California Department of Fish and Game, 1962)(Table 13). Under certain circumstances 1080 bait can be a potential hazard to seed-eating birds, and, in fact, some seed-eating birds, such as crown sparrows and magpies, have been killed, although no evidence exists that any significant losses to even very localized populations have ever occurred except with waterfowl (Marsh, pers. comm.).

The dyeing or coloring of grain bait has long been recognized as an aid in repelling many seed-eating birds (Kalmbach, 1943). It is also known, however, that some species such as waterfowl are not particularly repelled by colored bait. For example, waterfowl deaths occurred in the vicinity of the Tule Lake National Wildlife Refuge from eating dyed baits applied at high rates for an eruption of meadow mice which reached reported population levels of 3,000 per acre (Federal Cooperative Extension Service, 1959). Some dyes also tend to fade with time under field conditions (Rudd and Genelly, 1956), and, hence, their effectiveness as repellents may be reduced.

All 1080 bait used on Fort Hunter Liggett and Camp Roberts will be dyed yellow to reduce the possibility of birds eating the bait, recognizing, however, that this safeguard is not infallible. Since rodents are essentially colorblind, color additives in baits do not cause visual rejection by squirrels. Color additives have the following additional benefits:

1. Prevent possible accidental human consumption of the dyed bait and reduce the hazard of the bait being accidentally used for livestock feed.

2. Aid in bait preparation. Uniformity of color distribution in the finished product assures that thorough mixing has been achieved.

At the application rate of 6 pounds per swath acre (approximately 2.5 kernels/square foot), varying amounts of bait may remain a few days following application; however, residual bait was found to be lowest when the squirrel populations were high (Marsh, 1967).

The effect of 1080 baiting on terrestrial invertebrates at Fort Hunter Liggett and Camp Roberts is not known; however, Marsh (1968) did report his findings on 1080 bait concerning harvester ants and darkling ground beetles. Harvester ants

were killed by 1080 bait, and, thus, some impact on this species may occur very locally. Darkling ground beetles were capable of feeding on the treated bait without apparent harm. Marsh (1968) also reported that invertebrates apparently removed or consumed over 30 percent of the bait which was placed on the ground and protected by wire mesh caps. Biodegradation by invertebrates seems likely.

The direct poisoning of nontarget species in 1080 ground squirrel operations has been reported. Deer mice, kangaroo rats and pocket mice are believed to have been killed as the result of 1080 squirrel control programs, based on carcasses found or local populations censused (Marsh, 1968; California Department of Agriculture, 1973). Marsh (pers. comm.) and Howard (pers. comm.) believe that deer mice are probably the most affected of the nontarget rodent species because this nocturnal species is most apt to be found in close association with ground squirrels, which are diurnal, and because they are excellent foragers with a relatively high preference for oats. This close association with ground squirrels may be a factor in why they are suspected of being potential reservoirs of plague. In all likelihood, a local reduction in the deer mouse populations, and possibly other seed eating rodents, i.e., those inhabiting areas where the squirrels are to be controlled, can be anticipated in the 1080 treatment of Fort Hunter Liggett and Camp Roberts. That 1080 may be lethal to deer mice is supported by the fact that the U. S. Fish and Wildlife used to recommend and use baits (containing 0.55 percent 1080) for aerial broadcasting to control forest rodents (Fitzwater, 1972). However, this is seven times the dosage of 1080 that is to be used on the ground squirrels. Also, it was only applied at 0.5 pounds per acre, and was uniformally broadcast over the entire forest area instead of by spot treatment as with squirrel control.

Pocket gopher populations, which frequently occupy the same rangeland as ground squirrels, are not significantly affected by 1080 baiting aboveground because of their fossorial habits.

Those nontarget rodent species which are locally affected will have a tendency to recover more rapidly than squirrels because they have several litters a year as opposed to ground squirrels which have only one. Each subsequent baiting of ground squirrels will have about the same effect on the susceptible small rodent population.

Cottontails may be killed (Marsh, pers. comm.), although there is no current evidence that local populations are drastically reduced where squirrel poisoning has been undertaken. Jackrabbits are generally less vulnerable because of their greater

tolerance to 1080 and by the fact that it is difficult for this species to pick up lethal amounts of widely scattered grain. Grey squirrels will not be affected because they are not common in ground squirrel areas and are also quite tolerant to 1080.

The effect the relatively rapid reduction of a ground squirrel population would have on the food base of bird, mammal and reptile predators is not known for the areas in question. When ground squirrels are in high numbers, they undoubtedly play a role in the diets of diurnal predators that are large enough to kill ground squirrels. Snakes and other predators mostly take young squirrels; the importance of this role will vary with the specific predator. Since the activity of ground squirrels varies seasonally, they are more available as food for predators at specific times of the year. During the hotter periods of the summer the adult squirrels frequently go into aestivation, and hibernation in the winter months drastically reduces the number of squirrels available to predators at that time of year. Where high densities of squirrels exist, some mostly young-of-the-year, are active almost daily all year when the weather is favorable (Howard, pers. comm.; Marsh, pers. comm.).

Since the above ground activity of ground squirrels fluctuates rather dramatically from season to season, they probably are not a staple of the diet of predatory species throughout the year. Seasonally they may be a very important food item of certain predators. Since predators are, for the most part, opportunistic, selecting from what is available to them, any substantial artificial reduction in the density of ground squirrels would probably cause a shift in the diet of those predators which were currently utilizing ground squirrels. However, other species such as jackrabbits, meadow mice, pocket gophers and others not affected significantly by the control of ground squirrels would still be available to the predators.

Secondary Poisoning - Nontarget Species. Secondary poisoning is defined as the poisoning of a nontarget species as the result of consuming another animal which has died from 1080 bait. Secondary poisoning is the unfavorable characteristic most often expressed with regard to the use of 1080. The extent that secondary poisoning occurs from 1080 generally relates to how it is used. The way it is used in squirrel control is one of the least hazardous applications. The only time the hazard is not present is in pocket gopher control because the treated grain bait is placed underground within their burrow system. Considering that several million gross acres are treated annually with 1080 bait in California for

ground squirrel control, relatively few instances of secondary poisoning can be cited. The Canidae (dogs, coyotes and foxes) are very susceptible to 1080 and, hence, potential secondary hazards are of a greater concern with this group than with most other species, although members of the cat family, Felidae, are also quite susceptible. Most avian predators or carrion feeders are quite resistant to 1080 (Table 13). The potential for secondary poisoning relates to a number of factors concerning the carnivore's susceptibility and feeding behavior.

(1) What is the feeding behavior of the carnivore? Do they commonly feed on the target species (i.e. ground squirrels) or other rodent species which may be incidentally killed?

(2) Is the carnivore a carrion-feeder or does it take only live prey?

(3) Is the carnivore sufficiently susceptible to 1080 to cause its death through the consumption of dead rodents?

(4) The size of the carnivore compared to its prey may be an important factor (i.e. dilution factor).

(5) What percentage of the carnivore's daily total diet is made up of 1080-killed rodents?

(6) For how long will a squirrel carcass be acceptable, since flesh decomposition is relatively rapid in California's warm, dry weather.

(7) Will the carnivore feed on the intestinal tract or will it tend to eviscerate the squirrel? Larger amounts of 1080 may be found in the intestinal tract than in the animal tissues.

(8) Will they eat the entire squirrel including the contents of the cheek pouches, which may contain unconsumed 1080 treated grain?

(9) Is the carnivore capable of detecting early symptoms from 1080 and thus stop feeding on poisoned squirrels prior to receiving a fatal dose?

(10) Does the carnivore tend to regurgitate its prey when early poisoning symptoms occur, reducing the potential for fatal poisoning?

(11) Will the carnivore feed on material regurgitated by other carnivores or refeed on their own regurgitate?

The significance of any one of these factors depends on the species of carnivore or carrion-feeding mammal, bird or snake. There are still other factors concerning the prey or carrion which are equally important in determining any adverse impact on the carnivores. These include the following:

(1) How many squirrel carcasses will be available to the carnivores within their normal feeding range?

(2) What percentage of the squirrels will consume quantities of toxic bait greatly in excess of a lethal dose as opposed to those consuming just slightly over a lethal dose (Howard, 1959)?

(3) At the time of control are most of the squirrels pouching the grain bait, thereby increasing the potential for secondary hazards?

Field monitoring of the effects of 1080 grain baits on nontarget wildlife species has been conducted in the past by the California Department of Fish and Game (California Department of Agriculture, 1974; Swick, 1973; Griffith, 1976 memo; California Department of Fish and Game progress reports, 1958-1976; Hagen, 1972). No cases of secondary poisoning by 1080 were documented during those studies. The studies cited do not preclude the possibility that some losses, particularly to the canids, did occur; however, it is doubtful that significant losses could have gone undetected considering the man hours spent in the field. Circumstantial and other actual evidence indicates that occasionally dogs, coyotes or other highly susceptible mammals are indeed killed in squirrel control operations. Rudd and Genelley (1956) stated, "...ground squirrel control in California has assisted considerably in reducing coyote populations". Earlier, Kalmbach (1945) estimated "that rodent control may effect a 30 percent reduction in the coyote population of treated areas"; however, this estimate occurred only shortly after the introduction of 1080 by the U. S. Fish and Wildlife Service, and the concentration of 1080 used on the baits, the types of bait used, and techniques of application were not refined to reduce secondary hazards to the degree they are today (Howard, pers. comm.). Coyote populations naturally fluctuate, and during the past several decades in California there has been no evidence presented indicating that controlling ground squirrels has altered the density of coyotes (other than possibly locally) either by secondary poisoning or by reducing their food base.

Squirrel control, which is conducted on a regular basis every second or third year, is biologically sound for reasons other than effective reduction of squirrel populations. Evidence suggests that aversion or bait shyness in rodents, brought about by sublethal doses, occurs more commonly when acute rodenticides are used too frequently, and such averted

animals may well be protected for the rest of their lives. The same kind of induced aversion to prey has been studied in coyotes and in some avian species (Gustavson, et.al., 1976; Rusiniak, et.al., 1976; and Brett, et.al., 1976). The fact that substantial populations of foxes, coyotes, badgers, and other carnivores do exist in areas that have been consistently poisoned with 1080 or other acute rodenticides for over 25 years, may in part be explained by aversive conditioning.

A cooperative study by EPA, USFWS and California Department of Food and Agriculture is being conducted in Tulare County, but not in kit fox range. Both mammalian and avian species will be monitored during the time that 1080 is being used (Environmental News, March 29, 1977) (see Appendix J).

The number of poisoned squirrels available to predators has been suggested as one significant factor in possible secondary poisoning. According to previous post-treatment field analyses, 4 to 6 percent of poisoned Beechey ground squirrels were estimated to die above ground (U. S. Department of Army, 1968 memo). Of those squirrels dying above ground, many may have consumed or "pouched" much more than a lethal dose of bait, thereby increasing the hazards of secondary poisoning (U. S. Department of Army, 1968 memo; Swick, 1973).

In the process of hoarding food, the amount that will be pouched will depend on factors such as the season of the year, density of bait applied, availability of natural food, age of the squirrel, etc. Less pouching is believed to occur in areas of dense populations because fewer kernels are available to each squirrel (U. S. Army, 1968; Griffith, pers. comm.). Aerial baiting distributes the bait sparsely (i.e., approximately 2.5 kernels per sq.ft.) so that the squirrels are believed less capable of ingesting much more than one lethal dose and are also less capable of pouching large amounts of bait, thus reducing the potential for secondary poisoning of predators. These same factors also reduce the potential of primary poisoning by nontarget seed-eating species.

Aerial baiting has several other safety advantages over hand baiting. It drastically reduces the number of people coming into direct contact with the toxic bait, hence reducing potential human-related accidents. The use of aerial baiting has virtually eliminated the accidental loss of domestic livestock because of the reduced chance, when compared with hand baiting, of animals gaining direct access to containers of bait during the baiting operation or of someone spilling bait in the field. Livestock cannot eat a lethal amount of sparsely distributed aerial-broadcast bait.

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GROUND SQUIRREL CONTROL, FORT ORD COMPLEX FORT ORD, CALIFORNIA.(U)

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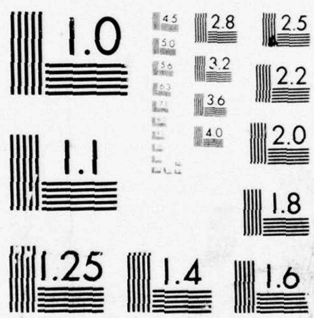

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Threatened, Endangered and Other Species of Concern. The San Joaquin kit fox, California condor, golden eagle, bald eagle, peregrine falcon, mountain lion, burrowing owl, bobcat and ring-tailed cat, are the threatened, endangered and other species of concern, which must be considered under the proposed action and associated impacts.

A condor has been reported sighted on Fort Hunter Liggett, although these sightings apparently are extremely rare. No evidence exists that condors have been feeding on any portion of the Fort Ord complex; however, because these birds readily feed on carrion and may be exposed to poisoned ground squirrel carcasses, the possibility cannot be ruled out since the study area is within the California condor's range (Wilbur et.al., 1972).

Joseph Keyes and others of the Fish and Wildlife Service watched for effects of 1080 on condors and other birds during trial applications in Kern County in 1945. Neither condors nor turkey vultures was found to be killed by eating squirrels poisoned with 1080.

Experiments on the toxicity of 1080 have been carried out by the National Research Council as reported by Koford (1953). He reported that the results of these experiments on the feeding of Compound 1080 to vultures were as follows: 20.0 mg/kg was required to kill 71 percent of 7 turkey vultures, and 50 percent of the 10 black vultures were killed at a dosage of 15.0 mg/kg. Judging by these results, a turkey vulture would have to eat as much as 40 times its own weight in poisoned squirrels before it would probably be killed. The amount would be less if the contents of the cheek pouches and stomach were eaten or if the squirrel had ingested more than the minimum lethal dose (Koford, 1953). Field studies conducted by Miller, et.al. (1965) produced no unequivocal proof of condor deaths resulting from condor poisonings; however, evidence was found related to poisoning operations for ground squirrels and kangaroo rats, which indicates a danger to condors could not be discounted. According to Hagen (1972), the California condor appears to be relatively immune to 1080. Turkey vultures, a near relative of the condor, have for years followed squirrel-poisoning crews, feeding on the carcasses of dead squirrels; however, secondary poisoning from 1080 in turkey vultures is unrecorded. Populations of turkey vultures seem to flourish in the areas where ground squirrels are routinely controlled with 1080. While the possibility does exist, there is no factual evidence, at present, that condors have ever been killed as the result of 1080 used for ground squirrel control; however, some circumstantial evidence has been reported (Leopold, 1964).

San Joaquin kit fox have been reportedly observed on both Fort Hunter Liggett and Camp Roberts. Only one den, however, has been reported and this was on Camp Roberts. Both of these military properties lie on the western margin of the kit fox's apparently expanding distribution range. Laughrin (1970) reported that between 1,000 and 3,000 San Joaquin kit fox were believed to exist in California. His distribution map did not even closely include the areas as far west as Camp Roberts or Fort Hunter Liggett. Since then Morrell (1975) completed an extensive study on the San Joaquin kit fox and found its distribution extended into areas where historically it had not previously existed. He also now estimates the population at a minimum of 5,066 and a maximum of 14,800 adults with a mean figure of 10,000. As the result of this study the San Joaquin Kit Fox Recovery Team, appointed by the Secretary of Interior, has recently met and recommended that this kit fox now be downgraded from Endangered to Threatened. In either case, every possible effort must be taken to protect this species. Therefore, as a special added precaution of this proposed action, and in part based on the findings of Schitoskey (1975), no 1080 bait will be used within 1 mile of any known kit fox dens. Special efforts will be made to locate kit fox dens prior to the control of ground squirrels. These special efforts will include an on-foot search of their habitat and aerial reconnaissance. Zinc phosphide bait will be used within that 1-mile radius of dens.

Recent evaluation made by the California Department of Fish and Game (1976) concluded that "the aerial application of compound 1080-treated grain bait for the control of ground squirrels in the vicinity of active San Joaquin kit fox dens (sic) has not caused any observable detrimental effect to kit fox in the areas surveyed." The present average densities of kit foxes in areas where ground squirrels have been controlled for over 25 years with 1080 is consistent with the aforementioned study (Morrell, 1975).

The golden eagle has been reportedly observed on all three installations. Golden eagles are both a predator and a carrion eater. At times, they will consume carrion instead of killing prey even through live food is available (Kalmbach, et.al., 1964). Food habit studies show golden eagles have a strong preference for small mammals, particularly rabbits and rodents. Carnie (1954) found ground squirrels and jackrabbits formed the dominant prey items taken by nesting eagles in California. Brown and Amadon (1968) concluded that these species may constitute 70 to 90 percent of an eagle's diet by weight, depending on locality and prey availability.

Birds make up a small percentage of the eagle's diet. Pheasants and sage grouse appear to be especially vulnerable during the breeding season. Many of the birds, which golden eagles capture, are often recently fledged (Beecham, 1970).

There is a potential for losses to golden eagles exposed to ground squirrels or carrion treated with 1080. Evans, et.al. (1970) state golden eagles, great horned owls and coyotes that consumed multiple feedings of zinc phosphide-poisoned jackrabbits showed no visible symptoms of secondary intoxication.

The endangered bald eagle is a frequent visitor to the Fort Ord complex. It is the only eagle whose distribution is restricted to North America. Historically, bald eagles nested in abundance in the Channel Islands and along the coast; however, inadvertent shooting, destruction of nesting trees, human encroachment, electrocution, pollution and contamination of the food chain by persistent pesticides (e.g., DDT and DDE) have been instrumental in their decline (Department of Fish and Game, 1976).

Fish make up a large part of their diet; however, the bald eagle is an opportunist and readily consumes carrion, including the remains of poultry, livestock, whales, otters, seals, fish and deer (Snow, 1973).

Like the golden eagle, some loss may be experienced by bald eagles if they consume ground squirrels or carrion containing lethal doses of 1080. The toxicity of zinc phosphide to bald eagles is not known.

The peregrine falcon is a rare visitor to Camp Roberts. It has not been reportedly observed on either Fort Ord or Fort Hunter Liggett. Estimates of population size are conjectural; however, the decline in the peregrine's numbers has been attributed to the use of persistent pesticides (e.g., DDT).

The peregrine's principal food items are passerine birds, waterfowl and shorebirds (Snow, 1972). A potential for loss exists if peregrine falcons utilize the area during the time of ground squirrel control; however, that loss will be minimal, if at all.

The mountain lion, a protected nongame mammal, has been observed on both Fort Hunter Liggett and Camp Roberts. There have been no reports of sightings on Fort Ord. Approximately 2,400 mountain lions are believed to exist in California. Sitton and Wallen (1976) conducted a 5-year study of 175-square miles of coast range in southwestern Monterey County to ascertain the total mountain lion population in the area and their range requirements. Figure 32a represents a composite of the ranges of mountain lions found in the area. Sitton and Wallen (1976) estimated the density of mountain lions in Monterey County to be approximately one lion for every 10 square miles within the study

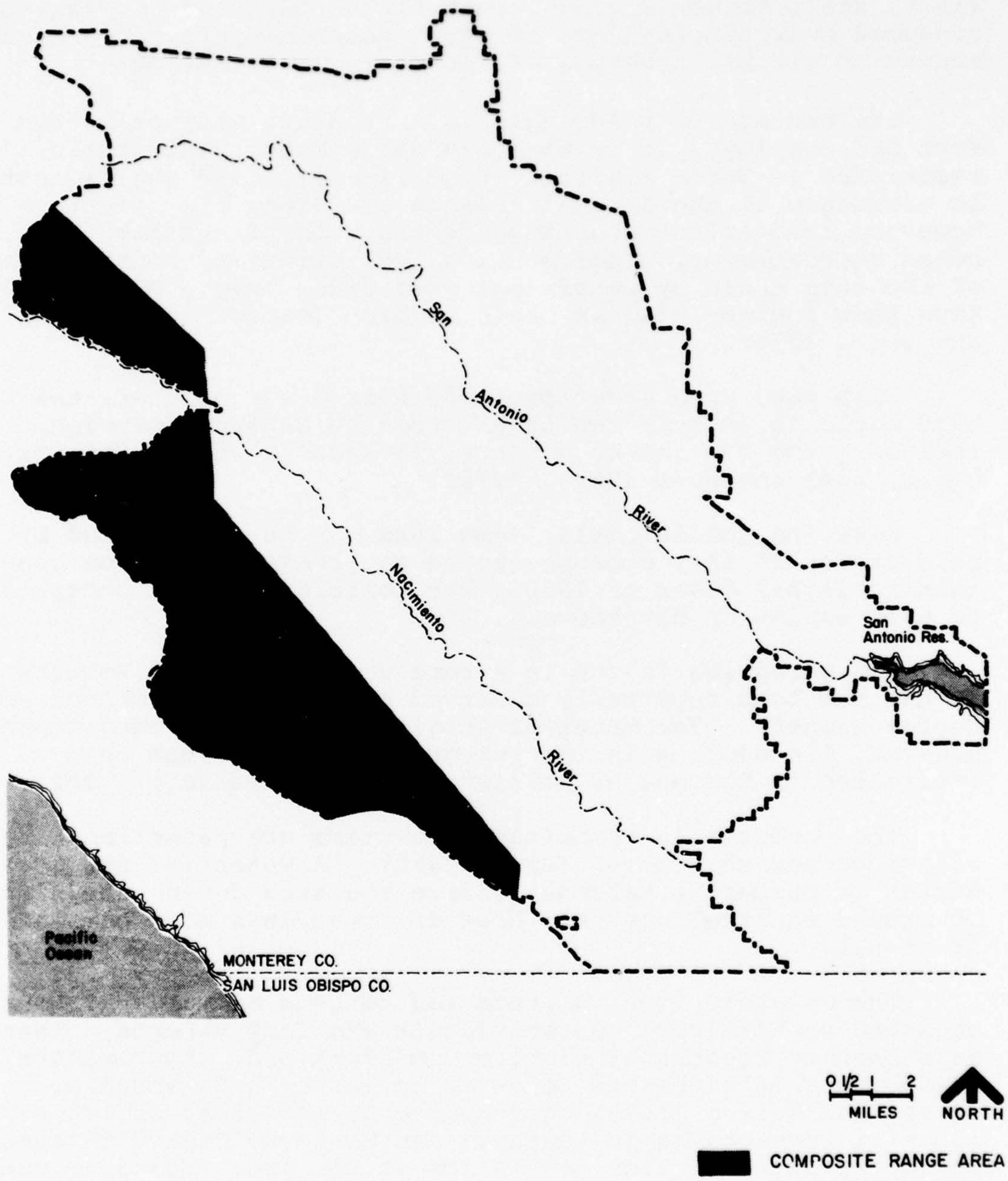

FIGURE 32a THE COMPOSITE RANGE OF MOUNTAIN LIONS IN SOUTH WESTERN MONTEREY COUNTY

SOURCE: DEPT. OF FISH & GAME, 1976.

area. There was no opportunity to study predator-prey relationships during the study; however, six different scat samples were collected and analyzed by California Fish and Game, Field Station. Identification of the undigested hair revealed that deer were the most prevalent food item.

Records of mountain lion stomach contents of Fish and Game date back to the early 1940s. During this time 15 stomachs were analyzed and evidence of unidentified rodent hair was found in one stomach (Griffith, pers. comm.). A preponderance of deer flesh, deer hair, porcupine hair, rabbit and birds were found, but very little in the way of rodents.

Recently, a mountain lion was found dead (March, 1977) at Fort Hunter Liggett near Nacimiento River, where squirrel treatment would be done. There was no evidence of pathological or mechanical injury involved so poisoning was suspected. The carcass was analyzed at University of California, Davis and by Fish and Game personnel. The cause of death has not been determined; however, 1080 poisoning has been ruled out (Griffith, pers. comm.).

There is no factual evidence that mountain lions have ever been killed as a result of 1080 used for ground squirrel control (Bischoff and Griffith, pers. comm.). The risk of secondary hazards to mountain lions does exist; however, a considerable portion of their range is non-squirrel habitat and is not scheduled to be treated. Moreover, approximately 90 percent of ground squirrels die in their burrow systems and since mountain lions normally prefer freshly-killed meat to carrion (Caras, 1967), the hazards of 1080 poisoning to mountain lions will be minimal.

The burrowing owl is found on all three installations. Beechey ground squirrels provide most of the owl's burrows (Thomsen, 1971). There is some debate whether burrowing owls dig their own burrows, but it is known that they are able to dig (Thomsen, 1971).

Destruction of some burrowing owl habitat is expected if burrow systems are disced; however, ground squirrels are constantly creating new burrows and vacating old ones, thereby providing ample burrows for displaced burrowing owls.

The bobcat is found in the rocky brush country on all three installations. Food habit studies have shown the major portion of the bobcat's diet to be rodents and rabbits (Leach and Frazier, 1953).

Bobcat populations, like other members of the Felidae family, are susceptible to 1080, thus a potential secondary hazard exists according to the feeding behavior of the bobcat.

The ringtail cat is a nocturnal mammal found mostly in the chapparal habitat and rocky ridges on Fort Ord and Fort Hunter Liggett. It has not been observed on Camp Roberts. Ringtail cats feed primarily on small mammals, insects, birds, fruits, lizards and invertebrates (Burt and Grossenheider, 1964). Some loss to ringtail cats may occur if lethal quantities of treated ground squirrels are consumed.

The mitigation of possible adverse impacts of 1080 on nontarget species is incorporated as part of the above section on fauna. To minimize hazards to humans and pets, 1080 baits will not be applied in close proximity to inhabited areas.

Well-trained personnel is an essential key in minimizing the impact of baiting programs on the environment. Supervisors and their employees must be knowledgeable in the characteristics of the rodenticide used and of the fauna in the ecosystem to be treated (Marsh, pers. comm.).

Arrangements for possible emergency medical attention should be made in advance of control efforts. Poison centers should be made aware of the toxicants in use, and local veterinarians should be kept apprised of the kind of rodenticides used so they can better diagnose and treat suspected or actual poisonings which may occur in pets or domestic livestock.

With the exception of the target species (ground squirrels), potential impacts on the wildlife will be of a relatively minor nature.

Aquatic Fauna. Aquatic life is considered to have a very low susceptibility to 1080. Studies by King and Penfound (1946) indicated that fingerling bream and bass experienced no apparent distress in concentrations of 1080 as great as 370 mg/l. It is judged that there will be no adverse impact on aquatic fauna from the proposed action.

Cumulative Effects on Biological Resources. Repeated sublethal doses of Compound 1080 under laboratory conditions have slightly increased the tolerance of some wildlife species (i.e., golden eagles, rats and mice) while in other species repeated sublethal doses over a very short period of a few hours to a few days accumulated to lethal levels (i.e., dogs, rabbits and mallards). However, a portion of sublethal doses at longer intervals can be excreted as 1080 or metabolized to nontoxic metabolites by some mammal species (In: Atzert, 1971). Crabtree (1962) stated that "Although repeated doses of sodium monofluoroacetate have been demonstrated to increase the resistance of rats to subsequent doses, this effect appears to be short-lived

and of little practical significance in its use as a rodenticide. Likewise, '1080' is not accumulative to any practical degree".

Experimental chronic intoxication studies of 1080 on rats were conducted by Miller and Phillips (1955). A diet of 20 ppm for 12 weeks gave symptoms of initial growth retardation followed by recovery. An increase to 40 ppm resulted in a brief transitory effect on growth. In another study, 0.002 percent in the diet for 10 months produced no liver tumors or cirrhosis in 16 animals treated and surviving (In: Hodge, et.al., 1963). Mazzanti (In: Atzert, 1971) described the result of sublethal effects with respect to regressive changes in the germinal epithelium of the seminiferous tubules of rats. Other researchers have bred 4 successive generations of rats whose parents had received sublethal doses of 1080 (Howard, et.al., 1959). In relation to 1080 and wildlife, Rudd and Genelley (1956) believed that, unlike some insecticides, the sublethal ecological effects of 1080 were not of concern.

The persistence of unchanged or unmetabolized 1080 in squirrel carcasses is important, for it contributes to the secondary poisoning. 1080 can be found in various organs and tissues in the killed animal in sufficient amounts that, under certain circumstances, death will occur when a susceptible animal consumes that carcass. It has been shown that dogs are killed by eating rats eight to ten weeks after they had been poisoned with sodium fluoroacetate (Scales, 1945). Secondary poisoning is well documented (Crabtree, 1962; Pattison, 1959; Scales, 1945). The use pattern determines the extent with which this occurs in the wild.

Fauna - Zinc Phosphide.

Primary Poisoning - Target Species. Zinc phosphide baits prepared on crimped oat groats will be used for both hand baiting and aerial application. A 0.8 percent concentration is used for hand baiting applied at an estimated rate of approximately 1 pound per acre (60 bait placements per pound). The amount per acre will vary with the squirrel density. For aerial application a bait concentration of 1.7 percent is used and spot broadcast on squirrel-infested area at 6 pounds per swath acre (i.e., approximately 2.5 kernels/sq.ft.). The acceptance of zinc phosphide bait by ground squirrels is considered to be less than that obtainable with 1080 (Hood, 1972). Whether applied by hand or aircraft the expected percentage of control of the beechey ground squirrel, using zinc phosphide baits can reasonably be placed at approximately 60 percent. Reference has already been made to the expected 60 percent efficacy of zinc phosphide under the section on methods. The initial efficacy of zinc phosphide upon the military lands in question may be somewhat higher since the

area has not been treated for 6-7 years. However, subsequent treatments as bait shyness develops will probably result in an efficacy of approximately 60 percent. Few published reports have been made on the efficacy of zinc phosphide in ground squirrel control -- one, a progress report in 1975 by the Denver Wildlife Research Center of the USFWS to the Mid-Pacific Regional office of the U. S. Bureau of Reclamation (Memorandum of understanding, Contract #14-06-200-7231A) indicates ground squirrel control of 79 percent to 92 percent -- however, corrections for control results ranging from 20 percent to 41 percent were apparently not considered. Applying correction for controls, the results would be significantly lower. Marsh (pers. comm.) and others who have evaluated zinc phosphide in San Luis Obispo County (Kalar, pers. comm.) and in Monterey County (Nutter, pers. comm.) generally support the 60 percent control factor. The erratic results of zinc phosphide for squirrel control have been mentioned earlier.

Hand baiting with zinc phosphide will be conducted on Fort Ord on rangeland and other select areas, and at Fort Hunter Liggett and Camp Roberts in areas where 1080 may be inappropriate. Zinc phosphide bait will be applied by aircraft within one-mile radius of active kit fox dens found on either Fort Hunter Liggett or Camp Roberts.

The effect of treatment of ground squirrels with zinc phosphide will be a reduction of the treated populations within a few days. Since the program will not result in the total elimination of ground squirrels, the rate which the various populations will increase during the next breeding season will depend upon the number of survivors (and their reproductive potential). The greater the density of a squirrel population, the higher the percentage mortality must be before the operation can be considered efficacious (e.g., a 50 percent reduction of a squirrel colony containing only two squirrels will leave the same number of survivors as 93.5 percent reduction of a colony containing 15 squirrels) (Howard, pers. comm.). Subsequent control with zinc phosphide may have to be as often as every year. In no instance is it recommended that zinc phosphide be used more frequently than once a year because of creating a serious problem of bait shyness in the surviving squirrels.

Since the use of zinc phosphide bait will likely give results inferior to 1080 bait regardless of the method of application, it can be anticipated that the squirrel populations will have to be retreated much more frequently than with the use of 1080 bait. Bait shyness or poor initial bait acceptance may make subsequent control efforts less successful. The maintenance of suppressed squirrel populations with zinc phosphide bait may be less than desirable.

Primary Poisoning - Nontarget Species. The factors for minimizing potential hazards which were discussed for 1080 (i.e., minimum effective doses, minimum rates of application, proper timing of control, type of grain used for bait, the dyeing of bait, etc.) are the same for zinc phosphide baits.

The characteristics of zinc phosphide make it somewhat less hazardous to some nontarget rodents because of its reduced efficacy on many rodent species primarily because the toxicant is poorly accepted. Because of its relatively strong odor which may be attractive initially to some rodents, the odor also can serve to create an aversion following a sublethal dose (Marsh, pers. comm.).

Based on past history of its use, zinc phosphide bait might be expected to be slightly more hazardous than 1080 to some bird species since most birds are more susceptible to zinc phosphide than are ground squirrels.

Geese have been killed as the result of ingesting zinc phosphide bait which was applied during a severe meadow mouse irruption in the area of Tule Lake (Keith and O'Neill, 1964); however, some rather unusual circumstances were involved. The rates of bait application for meadow mouse control were greater than those proposed in this action for ground squirrels.

At one time it was thought that zinc phosphide would degrade relatively rapidly in the environment (Crabtree, 1962); however, this has been shown not to be the case at least in some situations. In the Tule Lake incident, laboratory findings showed that about one-third of the original zinc phosphide remained on the bait after 3 months of exposure in the field (Keith and O'Neill, 1964). According to Hood (1972), zinc phosphide is considered relatively toxic to pheasants, ducks, geese and domestic fowl. The compound is considerably more toxic to meadow mice than squirrels (Table 14).

The application of zinc phosphide in the properly prescribed manner should reduce the incidence of mortality to nontarget wildlife. The possibility of incidental loss of a few seed-eating birds may occur; however, this would not be expected to have a measurable effect on the populations of such birds. Since waterfowl do not occupy the areas where squirrels are to be controlled, no potential hazard to them exists.

Even though some mortality of nontarget rodents may occur, the effect on the population will be short, as most rodent species which might be affected have several litters a year and populations will recover more rapidly than do ground squirrels.

Table 14

LD_{50} OF ZINC PHOSPHIDE ON DOMESTIC AND WILD VERTEBRATE SPECIES

Species	LD_{50} mg/kg	Average Weight, kg	Median Lethal Dose Required mg, LD_{50}
Cow	50.00	500	25,000
Desert kit fox	93.00	1.7	158.1
Dog	40.00	25	1,000
Cat	40.00	1.4	56
California ground squirrel	33.1	0.5	16.6
Northern pocket gopher	6.80	0.3	2.0
Bannertailed kangaroo rat	8.00	0.04	0.3
Deer mouse	40.50	0.02	0.8
Meadow vole	18.00	0.04	0.7
California meadow mouse	15.70	0.04	0.6
Muskrat	29.90	1.4	40.6
Wood rat	25.00	0.4	10.0
Black rat	21.00	0.2	4.2
Norway rat	27.00	0.3	8.1
Roof rat	43.40	0.2	8.7
Black-tailed jackrabbit	8.25	2.3	19.0
Mallard	13.00	1.2	15.6
Snowgoose	8.80	2.7	23.8
White-fronted goose	7.50	2.8	21.0
California quail	13.50	0.2	2.7
Mourning dove	34.20	0.2	6.9
Pheasant	26.70	2.5	66.8
Red-winged blackbird	23.70	0.2	4.8
Chicken	20.00-30.00	1.0	20.0-30.0

Source: Vertebrate Pest Control Handbook, California Department of Agriculture, 1975; Pittman-Robertson Report, California Department of Fish and Game, 1962.

Generally, much less is known on the effects of zinc phosphide than 1080 on the nontarget fauna because it has not been used nearly as extensively for ground squirrel control and hence has not been studied as thoroughly.

Secondary Poisoning - Nontarget Species. The major threat of secondary poisoning is from the toxic kernels which may be in the cheek pouches of poisoned squirrels and the viscera of poisoned squirrels, since zinc phosphide is not assimilated into tissues and bones (Hood, 1972). Storer and Jameson (1965), Przygodda (1951), and Evans (1970) indicated that dogs and cats are most susceptible to secondary poisoning and that in laboratory tests, golden eagles, vultures, great horned owls, other raptors, and coyotes receiving multiple feedings of zinc phosphide-poisoned jackrabbits showed no intoxication symptoms.

It has been shown that zinc phosphide is a relatively strong emetic to some members of the canid group (Schitoskey, 1975); therefore, this undoubtedly serves as a protective measure against secondary poisoning of dogs, fox and coyotes. As with 1080, zinc phosphide probably causes an aversive reaction which then protects predators once they have experienced the symptoms of a sublethal dose. Experimental feeding of poisoned prairie voles (*Microtus ochrogaster*) for 3 days to red and gray foxes and to great horned owls did not kill any of the test animals; however, changes in patterns of behavior were noted (Bell and Dimmick, 1975).

According to Rudd and Genelley (1956), poisoned ground squirrels remain toxic for several days after death until acid conditions of the stomach render the zinc phosphide less toxic.

Schitoskey (1975) found that the desert kit fox (*Vulpes macrotis arsipus*) was atypical in its response to doses of zinc phosphide and has an LD_{50} of 93 mg/kg of body weight, nearly 3 times more resistant than ground squirrels. Under laboratory conditions, kit foxes survived repeated feedings of kangaroo rats, each killed by 480 mg of zinc phosphide, equivalent to 3 times the LD_{50} for a fox. Because of this tolerance in the related subspecies of kit fox, ground squirrel control within a mile of an active San Joaquin kit fox den will be conducted with zinc phosphide rather than with 1080.

On studies conducted at Camp Roberts (California Department of Food and Agriculture, 1974), 9 percent of the zinc phosphide-poisoned squirrel population died on the surface, approximately 5 percent more than the average mortality

remaining above ground with 1080. While it appears that a large percentage of the poisoned squirrels die underground, the number remaining above ground has to be recognized as a potential source of secondary poison. However, this hazard is considered minimal to most nontarget species.

Threatened and Endangered Species. Although the use of zinc phosphide for rodent control is generally considered slightly more hazardous than 1080 to birds, there is no evidence that bird populations are significantly affected by its limited use in ground squirrel control in Monterey and San Luis Obispo Counties. Bird losses in other areas (i.e., Fresno County) extensively using zinc phosphide for squirrel control have been few.

According to Schitoskey (1975), zinc phosphide is the safest to kit fox of the three acute rodenticides tested. The potential hazards to kit fox are believed minor, although a slightly greater percentage of squirrels will die above ground rather than in their burrows. Kangaroo rats and the smaller rodents make up the greater portion of the San Joaquin kit fox diet (Laughrin, 1970). The small size of the kit fox relative to the size of ground squirrels may preclude its use as a significant prey item. The extent to which kit fox feed on squirrels as carrion is unknown.

The possibility of a potential adverse impact on rare and endangered fauna is remote.

Aquatic Fauna. If the level of 0.34 mg/l of zinc were to be maintained in waters containing freshwater aquatic life, some adverse effects may be experienced; however, the sensitivity of fish to zinc varies with species, age and condition of the fish, as well as with the physical and chemical characteristics of the water. Other ions may have a synergistic effect on the toxicity of zinc (McKee and Wolf, 1971). Jones (1938), as reported in McKee and Wolf, reported that for mature fish, the lethal limit for zinc in water containing 1 mg/l of calcium is only 0.3 mg/l, but in water with 50 mg/l of calcium, as much as 2.0 mg/l of zinc is not toxic.

Mitigation of possible adverse impacts upon aquatic life will be based upon avoiding the placement of zinc phosphide treated bait directly into any water impoundment or stream.

Cumulative Effects on Biological Resources. There is no reported evidence of cumulative toxic effects or of persistence as zinc phosphide in the environment.

There will be no effect on archeological/historical resources for the proposed action or its alternatives. See Appendix H.

Flora. Sodium monofluoracetate in the form of monofluoroacetic acid, has been noted to adsorb to a high degree on plant root tissues and other cellular materials (Hilton, et.al., 1969), while David and Gardiner (1951) found plants to be much less sensitive to sodium monofluoroacetate than are animals. Given the low dosage of 1080 per acre (2.6 grams), it is unlikely that plants would have the opportunity to utilize sodium monofluoroacetate in the form of monofluoroacetic acid (FCH_2COOH) prior to its decomposition by *Pseudomonas* and *Nocardia* species of soil microorganisms (Peters, 1975; Atzert, 1971).

The amount of zinc phosphide used will not affect flora when applied at the contemplated rate of 2.5 kernels of seed per square foot. Zinc ion is a normally-occurring essential trace element in soils at levels 10-250 ppm of surface soil (Buchman and Brady, 1969). Phosphine gas from the zinc phosphide will be converted to phosphate in the soil. There will be no adverse impact upon flora.

Public Health. There will be no significant adverse impact upon public health if chemicals are applied as required by state laws and recommendations, and the guidelines in the vertebrate pest control handbook. There will be a beneficial impact resulting from control of ground squirrels, since the population of this species which act as hosts for plague-infected fleas will be diminished.

Economics. The costs of treating the open range on Fort Hunter Liggett and Camp Roberts with 1080-treated grain will be $9,638 plus $150 per hour of flying time. (86 hours x $150 = $12,900, or a cost of $22,538). No significant impact upon the local economy should result, since no additional personnel will be hired. Other than the pilot, presently employed county and military personnel will be used.

The costs of ground squirrel treatment by hand on open range on Fort Ord with zinc phosphide will be $693 excluding labor costs of any personnel. Thus, the total cost of treating open range areas of the Fort Ord Complex will be approximately $23,231. Approximately $175,000 annually in crop and pasture damages will be saved by adjacent land owners.

Land Use. The application of 1080 and zinc phosphide to military lands would have no effects upon land use except as follows:

Military Mission. Rescheduling of military activities in treated areas would be of minor significance if adequate notice is given so that no military personnel would be in the area being treated for the brief time any given area is being overflown (1,500 acres covered per hour).

Recreation. Similar to above.

Grazing. Uniform application of bait at the low rate of 2.5 kernels of bait per square foot in squirrel-infested areas would not have significant impact upon grazing. The noise and movement of the airplane at low levels may cause some disturbance to stock. The use of a low-flying airplane over concentrations of stock probably should be avoided as a mitigation measure.

Transportation. The only effect which this operation may have on transportation may be the very brief periods during which traffic on military roads may be stopped or diverted during the actual aerial application of the bait. There is, therefore, no significant impact to be expected upon transportation (circulation).

Noise. The airplane used to apply toxic bait may typically be propeller-driven by a single 400-500 horsepower piston engine. The noise which will be apparent will be during takeoff, landing and the aerial application of the bait. The airplane may be expected to produce a sound level of 81 dB at a distance of 1,000 feet. This sound will be noticeable for a relatively brief time from any given point, since the entire flying operation should not exceed 86 hours. There will therefore be no significant impact resulting from the airplane noise. There will be few, if any, humans in or near the areas being treated, and the sound level will produce at most a very brief irritation. The sound of this airplane will be negligible in view of the ambient noise resulting from military helicopter, other aircraft operations, the use of small arms firing ranges, and heavy artillery up to 155 mm. Mitigation will consist of avoiding maneuvers near occupied dwellings or concentrations of humans.

Air Quality. The use of zinc phosphide or 1080 in a solid bait form would not cause changes directly in air quality over any significant area. Very minute amounts of bait chaff would add temporary particulate matter to air while mixing. The use of zinc phosphide and 1080 upon grain entails certain handling and mixing operations during the preparation of the bait, therefore site-specific changes in air quality may occur due to the presence of toxic particulate matter or liberated volatiles.

Low levels of phosphine gas may be released to the air during mixing of zinc phosphide and cause poisoning by inhalation. Mitigation consists of appropriate respirators and exhaust fans to remove 1080, phosphine gas and particulate zinc phosphide from the area where the mixing and handling of zinc phosphide is conducted. Care must be taken to exhaust this air in such a manner that adequate dilution of the 1080, phosphine gas and zinc phosphide will occur, and thus eliminate a hazard.

Air quality may be affected by the exhaust products resulting from the combustion of aviation fuel (aerial applicators) or regular gasoline (vehicle application) over the area to be treated. One hour of flying time may consume up to 20 gallons of aviation fuel.

One estimate of uncontrolled emission rate from an airplane piston engine (EPA) is as follows (averaged for idling, take-off, flying and landing) per pound of fuel per hour: 0.886 pounds of carbon monoxide; 0.056 pounds of total hydrocarbons; and 5.3 pounds of NO_x (as NO_2). Since one gallon of gasoline weighs approximately 6.3 pounds, the emission to be expected from 20 gallons (126 pounds) of gasoline during a one-hour period would, therefore, be 111.6 pounds of CO; 7.1 pounds of THC; 651 pounds of NO_x (as NO_2). Based upon 1,500 acres flown per hour, the 128,500 acres of Hunter Liggett and Camp Roberts would require about 86 hours flying time for treatment.

This amount of emissions would not have a significant impact upon air quality. Emissions due to transport of materials by ground vehicles are also insignificant.

Soils.

1080. There is abundant evidence that sodium monofluoroacetate can be degraded into nontoxic components (Peters, 1975). The carbon-fluorine (C-F) bond of compound 1080 can be ruptured by enzyme systems in Pseudomonas and Nocardia species of soil microorganisms (Peters, 1975). Therefore, sodium monofluoroacetate leached into the soil will be held in the upper layers and decomposed by soil bacteria. Studies by Horiuchi (1961) indicated that sodium monofluoroacetate exhibited no measurable toxicity within 2 weeks when applied at the rate of 10 ppm; and no measurable toxicity within 11 weeks when applied to soils at 50 ppm.

Zinc Phosphide. Zinc phosphide when leached into the soil rapidly breaks down into zinc ions and phosphine gas, which in turn is converted into phosphates. There is therefore no significant impact upon soils since the contemplated rate of application of 5 kernels of seed per square foot leads to less than 1 mg of zinc ions per square foot, which is far below the normal level of 10-250 ppm of zinc in surface soils.

Energy. Based upon the assumption that the 128,500 acres of Hunter Liggett and Camp Roberts will be flown at the rate of 1,500 acres per hour, there would be 86 hours flying time. At the rate of 20 gallons of aviation gasoline per hour, 1,720 gallons of gasoline would be consumed. This is an irretrievable use of energy.

Other energy consumption would be concerned with the production of 1080 and zinc phosphide, and the growing, harvesting and processing of the oats required for bait. These have not been calculated, but are not significant.

Areas of Human Activity

Zinc phosphide use will be minimal in areas of human activity and restricted to Fort Ord. Therefore, any impact on the environment will probably be insignificant. For details on the possible impacts of zinc phosphide use, see the impact section under Open Range above.

Water Resources. Anticoagulants (e.g. diphacinone) will be used around inhabited areas and in special cases (bivouac areas) in open range away from cantonments. Most anticoagulants are considered to be stable compounds (California Department of Food and Agriculture, 1975); however because of the small amount and the localized nature of application of anticoagulants, it is judged that there will be no significant impact resulting from the application of that rodenticide.

Fumigants applied in minimal amounts in areas of human use will probably have no significant effect on water or other resources.

Carbaryl (Sevin) dust will be used prior to the application of zinc phosphide or anticoagulant rodenticides in areas of human activity. Because the 10 percent concentration will be used only in association with squirrel control in and immediately adjacent to inhabited areas (i.e. cantonment and bivouacs), there is little possibility of adverse impact on water resources.

Fauna.

Direct Poisoning - Target Species by Anticoagulants. The ingestion of an anticoagulant compound by ground squirrels will result in the reduction of a localized population. The effects of the control program will only be localized in nature because anticoagulants will only be used in specific situations -- around cantonments and in bivouac areas rather than on a broad scale.

The efficacy of anticoagulants in reducing local ground squirrel problems will be dependent upon 1) acceptance of the bait and 2) the availability of bait. Because of the nature of the action of anticoagulants, they must be fed upon several times over a period of days, and a large amount of bait per squirrel is necessary to achieve effective control (California Department of Food and Agriculture, 1975).

The reduction of the ground squirrel population using anticoagulants will have a minor effect on the total area-wide population.

Direct Poisoning - Nontarget Species by Anticoagulants. The major nontarget species to be affected by anticoagulants will be rodents other than ground squirrels, which may consume baited grain. Those species are deer mice, house mice, Norway and roof rats, kangaroo rats and meadow mice. Toxicity information for specific animals is not known for diphacinone. Because the anticoagulants will be set out in bait boxes there will be little chance of poisoning to any larger species. Any bait brought out of the bait boxes could be ingested by birds or larger mammals; however, it is unlikely that a lethal dosage could be consumed in this manner. The use of bait boxes will prevent feeding on baited grain by dogs and cats, which have been known to be poisoned in the past by directly consuming bait.

Secondary Poisoning - Nontarget Species by Anticoagulants. The likelihood of secondary poisoning with anticoagulants is slight. There have been relatively few demonstrated cases of secondary poisoning from anticoagulants under field conditions. Prier and Derse (1962) conducted lab analyses of secondary poisoning on dogs. Results showed that dogs were killed by a continuous primary intake of warfarin but were unaffected by continuous ingestion of mice which had eaten warfarin bait.

Because the use of anticoagulants will be limited to areas around cantonments and in outlying bivouac areas, those animals most likely to come in contact with poisoned squirrels will be cats and dogs.

As a precautionary measure, dead squirrels should be picked up and disposed of. Such practices should significantly remove any secondary exposure.

Aquatic Fauna. There are few data available relating the toxicity of anticoagulants to aquatic life; however, due to the small quantities to be used and the controlled conditions (use of bait boxes) under which anticoagulants will be used, there is little likelihood of any effect on aquatic organisms.

Cumulative Effects on Biological Resources. Anticoagulants are known to have a cumulative effect on the target species (i.e., successive feeding on bait is necessary to achieve control) but anticoagulants are not likely to cause any major impact. However, no specific data are available to confirm this.

Direct Poisoning - Target Species by Fumigants. Application of fumigants to ground squirrel burrows may result in elimination of most ground squirrels inhabiting the treated burrow system.

The efficacy of fumigants on active ground squirrels will depend on: 1) the amount of soil moisture; 2) the ability of the user to seal all burrow entrances; and 3) the speed at which the fumigants move through the burrow system.

The reduction of the ground squirrel population using fumigants will have a minor effect on the total areawide population.

Direct Poisoning - Nontarget Species by Fumigants. Other vertebrates, such as lizards, snakes, toads, burrowing owls, and other rodents, which often occupy ground squirrel burrows (Linsdale, 1946; Thomsen, 1971), may incidentally be killed by fumigants. However, use of fumigants (or any other rodenticide) will result in many more unoccupied squirrel burrows, which will then be available for these other species. Data are generally lacking on specific hazards to nontarget species. In practice, relatively few nontarget species will probably be involved because fumigant use will be minimal.

Because actively-used ground squirrel burrows are used relatively infrequently by other species, losses of nontarget species can be avoided by gassing only active squirrel burrows. Bird droppings, recently enlarged burrow openings, fresh snake trails in the soil, etc. provide evidence that a burrow may be occupied by some species other than ground squirrels and thus should not be treated. Den sites of foxes, badgers, skunks, etc. should be identified as such and not treated. Animals only temporarily occupying squirrel burrows will most often be driven out of the burrow on first detection of fumigant odors.

Fumigants, such as methyl bromide, may also be hazardous to terrestrial invertebrates inhabiting ground squirrel burrows, and to ectoparasites of ground squirrels.

Aquatic Fauna. Fumigants, when dissolved in water, may have detrimental effects on aquatic life. Carbon bisulphide at concentrations of 100 to 127 mg/l was lethal to one species of sunfish (Shelford, 1917, In: California State Water Resources Control Board, 1971). The threshold of toxicity for perch has been reported at 35 mg/l (Meinck, et.al., 1956, In: California State Water Resources Control Board, 1971). However, use of fumigants will be minimal and applied under moist ground conditions, so that the gas will be confined to the treated burrow system. Therefore, a significant impact on aquatic life is unlikely.

Cumulative Effects on Biological Resources. Fumigants in their gaseous state dissipate rapidly in open air and therefore would probably not persist in the environment in significant amounts.

Direct Poisoning - Target Species by Carbaryl. The efficacy of control of fleas using carbaryl will be highly variable. Under certain conditions, the success of flea control using carbaryl has been found to be low, while in other situations control has been satisfactory.

Direct Poisoning - Nontarget Species by Carbaryl. Carbaryl is considered to have a low toxicity to mammalian and avian fauna (California State Water Resources Control Board, 1971) (i.e., LD_{50}s for some wildlife are: young mallards, 2,180 mg/kg; Canada geese, 1,790 mg/kg; Norway rats, 540 mg/kg). Given the low concentration (10 percent) and the limited use of carbaryl, it is judged that the impact on mammalian and avian species will be nonexistent.

Carbaryl is considered highly toxic to honeybees and earthworms (at 0.1 percent concentration) (U.S. Executive Office, 1971). The application of carbaryl on the military reservations may cause mortality in local populations of earthworms and honeybees and may be injurious to the number of other beneficial insect species because of the localized use of the insecticide. The impact will be minor.

Aquatic Fauna. Carbaryl is known to be toxic to aquatic vertebrate and invertebrate species (California State Water Resources Control Board, 1971; U. S. Executive Office, 1971). Toxicity values for fish in terms of LC_{50}'s (lethal concentrations in parts per million) range from 0.764 ppm for coho salmon to 20.0 ppm for black bullheads (California State Water Resources Control Board, 1971).

Aquatic insects are also very susceptible to carbaryl (LC_{50} for: stonefly - 0.015 ppm; waterflea - 0.0006 ppm; amphipods - 0.040 ppm).

In the unlikely event that carbaryl comes in contact with a water body containing aquatic fauna, there would be a possibility of localized aquatic insect dieoffs.

Any effects on aquatic life would be highly unlikely because of the limited use of carbaryl.

Cumulative Effects on Biological Resources. Carbaryl is nonpersistent and is known to break down rapidly following initial application. Barrett (1968) found that carbaryl applied at the rate of 2 pounds per acre resulted in initial residues of 35 ppm on plants but after 16 days residues amounted to 0.37 ppm.

Flora. There will be no significant impact upon flora by zinc phosphide, diphacinone or by carbaryl. Barrett (1968) determined that there was no effect upon millet when carbaryl was applied at the rate of 2 pounds per acre.

Carbon bisulphide and methyl bromide may have an effect on plant life. Therefore neither methyl bromide nor carbon bisulphide gas should be used to treat ground squirrel burrow systems located under or near trees.

Public Health. There will be no significant adverse impact upon public health if chemicals are applied according to the proposed procedures following recommendations of the Vertebrate Pest Control Handbook.

Air Quality. Diphacinone bait will have no significant effect on air quality. Fumigants used in minimal amounts will dissipate rapidly in the open air and should have no significant impact on air quality. The application of carbaryl dust into ground squirrel burrow systems will be accomplished by using a hand grinder dust applicator. Minor amounts of carbaryl dust will be dispensed into the air during application but will dissipate quickly.

Economics. There will be no significant adverse economic impacts. Costs of anticoagulants will be approximately $370 for Fort Ord, $2,960 for Fort Hunter Liggett and $2,960 for Camp Roberts. The cost of fumigants will be minimal. Costs of carbaryl will be $225 for Fort Ord, $1,125 for Fort Hunter Liggett, and $1,125 for Camp Roberts, excluding labor costs, which will be primarily military personnel. No additional personnel will be employed. Thus the total cost of treating human use areas of the Fort Ord complex will be approximately $8,225, excluding labor costs.

Land Use. The use of these chemicals will have no significant impact upon land use within the areas of human activity.

Energy. There will be a minor use of fuel for transport and distribution of anticoagulants and bait boxes.

Transportation. No impact upon transportation.

Soils. No impact upon soils.

Special Areas of Concern

Impacts in these areas will be insignificant, and will be similar to areas of human activity (above).

Costs of applying treatment will be dependent upon the actual number and size of areas treated. Areas such as dam faces, 1-mile proximity to kit fox dens, etc., will be treated as needed. Cost of diphacinone will run about $2.20 per acre excluding personnel costs. Fumigant costs will be minimal.

Alternative Actions

Generally, alternative actions warranting consideration are those that can meet the same objective as the proposed action -- in this report, that of reducing high ground squirrel populations to minimize the threat to public health or damage to military installations or surrounding private lands.

There are many potential methods for ground squirrel control. The major methods are chemical, mechanical and biological control. Each of these were discussed in detail in the section "Methods of Ground Squirrel Control". Table 12 analyzes the feasibility of many of the methods discussed, both for large scale control and limited use.

Generally, the methods listed in this table were determined to be infeasible for large scale use for a variety of reasons discussed in that section. Certain of the methods had some practical application for limited control. Those methods determined as infeasible are not considered viable alternatives and therefore not considered further.

The control methods described in the proposed action were divided into control on "open range" and control in areas with high human habitation or activity. The impacts of each have already been discussed. Since control in areas of human use is severely constrained by the limited number of significantly different chemicals and methods, the feasible alternatives of each were essentially covered in the proposed action section and will not be discussed further as alternative actions.

Therefore, the viable alternative methods of ground squirrel control included in this section will concentrate upon feasible choices in the application of ground squirrel control methods on open range or extensive land areas at Fort Hunter Liggett and Camp Roberts (Fort Ord ground squirrel problems are minimal on open range). In addition, the "no action" alternative is discussed.

Alternative 1

In this alternative the use of 1080 will be avoided and zinc phosphide will be substituted for the same areas in which 1080 was proposed. In all other respects, treatment (and impacts) would remain the same as the proposed action; e.g., Diphacinone, fumigants, etc., together with carbaryl, would be used in areas of human use and in special situations as needed, such as dams, near streams or reservoirs, etc.

The change from 1080 to zinc phosphide will apply only to the "open range" of Fort Hunter Liggett and Camp Roberts. No compound 1080 was proposed to be used at Fort Ord.

The areas in question, as described in the proposed project, total 128,500 acres and will be treated aerially with zinc phosphide bait applied only to squirrel burrow concentrations (an estimated 6,425 acres) as with 1080 bait described in the Proposed Action section.

Zinc phosphide applied aerially at the rate of 6 pounds of bait per treated acre, would represent 1.38×10^{-4} pounds of bait per square foot (.0625 grams/square foot). (Based upon a bait formula of 1.69 percent, this represents 2.3×10^{-6} pounds of zinc phosphide per square foot [0.00106 grams/square foot] per treated acre.)

Impacts. Zinc phosphide in the proposed concentration added to the environment in the form of treated grain would be expected to have minor impacts upon environmental elements, with the exception that non-target species such as seed-eating birds may be adversely affected (see Proposed Action Impacts).

Zinc phosphide may have approximately 60 percent effectiveness (as compared with 90 percent effectiveness for 1080) as has been discussed earlier -- probably related to lack of bait acceptance.

There will be an impact with respect to cost; e.g. aerial treatment with 1080 bait will cost $0.17 per treated acre ($22,538) and treatment with zinc phosphide will cost $0.19 per acre ($24,465). The costs of treating human use areas on all three installations as well as the open range on Fort Ord will remain the same. Thus the total cost of Alternative 1 in comparison to the proposed action (total cost $31,445) will be approximately $33,383.

However, the relatively low effectiveness of zinc phosphide may require additional treatment for ground squirrels, with corresponding proportionately higher costs.

Alternative 2

Alternative 2 is directed to only Fort Hunter Liggett and Camp Roberts. Under Alternative 2, ground squirrel control is not carried out on the large open range areas. The treatment methods for Alternative 2 remain the same as that described for human use areas and areas of special concern in the proposed action. Alternative 2, however, also includes the establishment of basically a one-mile buffer strip around the human use areas or adjacent to damaged private property within which either compound 1080 or zinc phosphide, aerially applied, would be used for control. The areas outside the buffer zone would receive no treatment. The purpose of treatment in the buffer zone is to prevent re-infestation of ground squirrels in treated areas, i.e., human use areas or by ranchers on adjoining properties.

The objectives of this alternative would be to 1) satisfy the public health concerns in public use areas, 2) reduce ground squirrel populations on lands immediately adjacent to private agricultural lands thereby reducing squirrel-related crop damage, and 3) eliminate damage to military structures and facilities. This alternative would also reduce the total number of acres of land receiving ground squirrel control.

The selection of this alternative would mean that 3,125 fewer acres of open range land would be treated with poison bait at Fort Hunter Liggett, or 975 fewer acres at Camp Roberts than that acreage treated under the proposed action.

Under this alternative the width of the buffer strip would be one mile or the width of adjacent ground squirrel habitat, whichever is smaller.

Control Methods in Cantonment and Other Human Use Areas. The multiple control method concept presented in the proposed action also would be used with this alternative. A combination of anticoagulants (diphacinone), fumigants (carbon bisulfide, methyl bromide), or zinc phosphide would be used for squirrel control, in association with carbaryl for flea control. The areas of selected use of these control methods would include all cantonment, bivouac, recreation (i.e., picnic areas) and physical structures (roadways, dam faces, radar towers, etc.) within Fort Hunter Liggett and Camp Roberts (see Figures 33 and 34). The zone of application of these compounds would extend 200 yards beyond the boundary of human use.

The estimated acreage of the cantonment and other human use areas mentioned above is as follows: Fort Hunter Liggett, 3,000 acres (cantonment areas will require 3,200 pounds of anticoagulants); and Camp Roberts, 3,000 acres (3,200 pounds of anticoagulants will be used for cantonment areas).

Control Methods in Buffer Zones. The method of treatment on these areas would be with 1080 or zinc phosphide.

The estimated acreage of these buffer areas would be: Fort Hunter Liggett, 22,000 acres of agricultural buffer and 5,000 acres of buffer around human use areas; Camp Roberts, 17,815 acres of agricultural buffer and 1,485 acres of buffer around human use areas (see Figures 33 and 34).

With this alternative, the rodenticides required to carry out the control program would amount to the following:

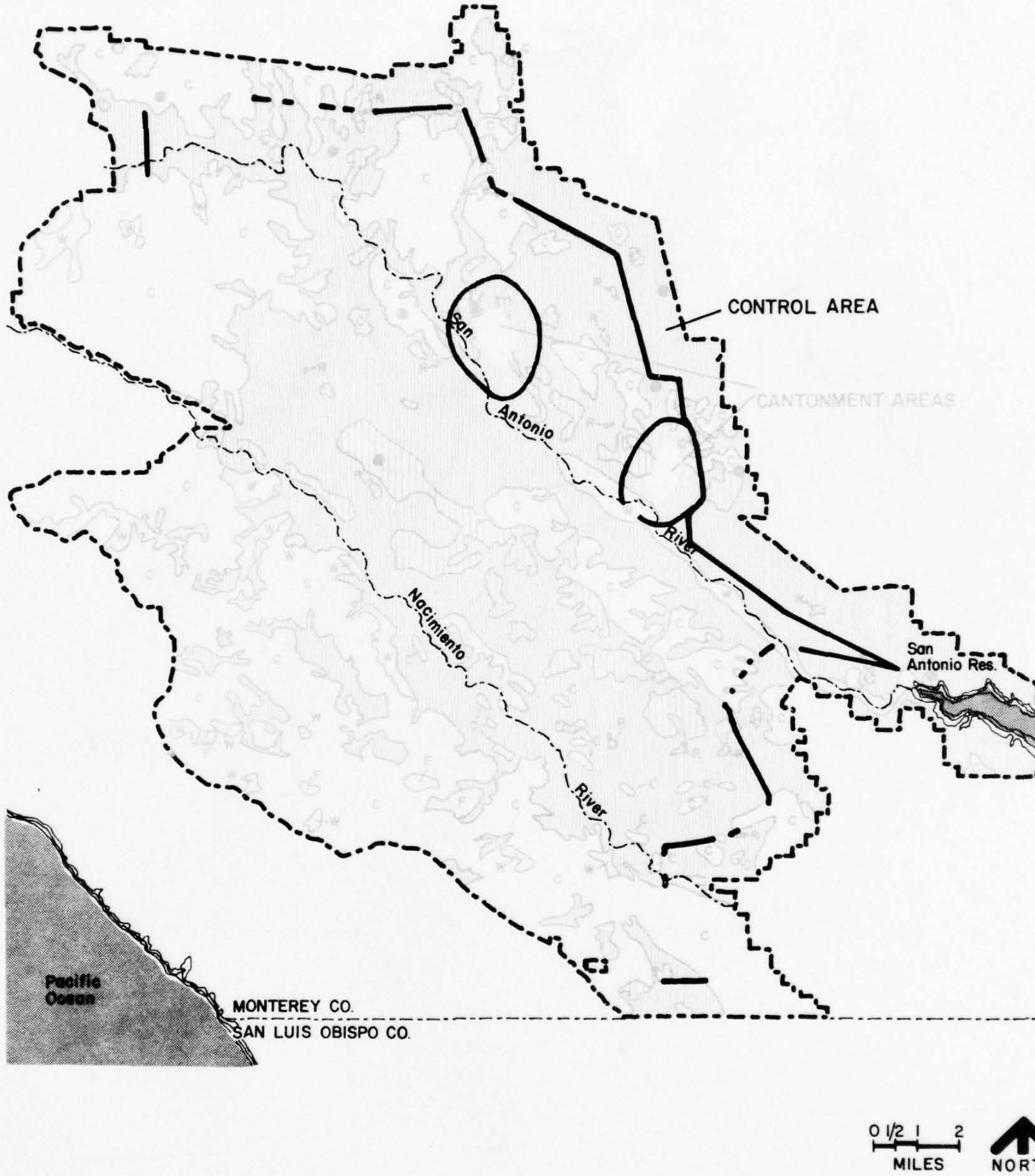

FIGURE 33
AREAS OF PROPOSED CONTROL UNDER ALTERNATIVE 2

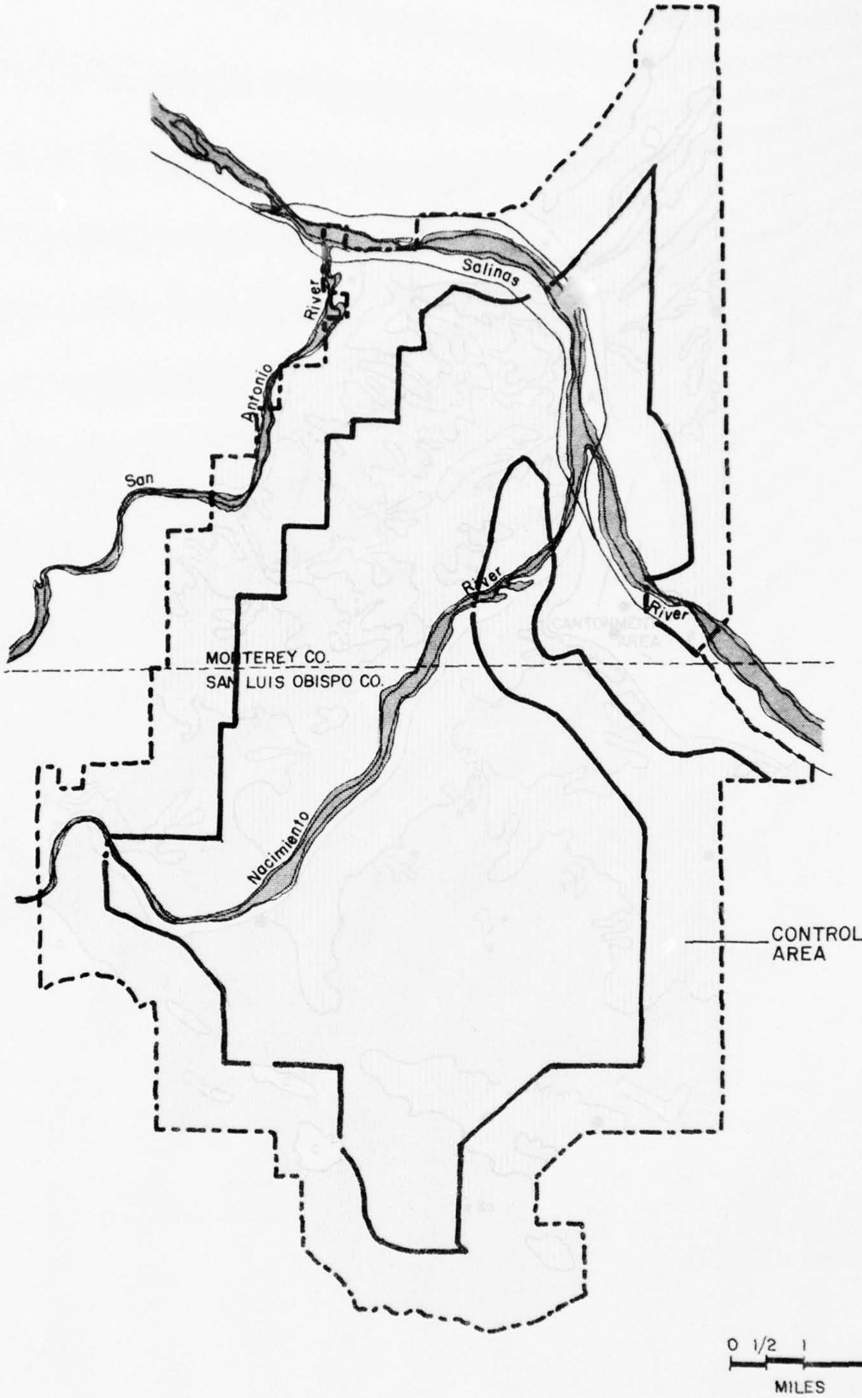

FIGURE 34
AREAS OF PROPOSED CONTROL UNDER ALTERNATIVE 2

Fort Hunter Liggett - the 1,350 acres of agricultural and human use buffer representing 5 percent of the total buffer zone area will require 8,100 pounds of 1080 bait or zinc phosphide bait (at 6 pounds/acre).

Camp Roberts - the required amount of 1080 bait or zinc phosphide bait would amount to 5,850 pounds for 975 acres of agricultural and human use buffer.

The main advantage of this alternative would be that significantly less acreage of open range on both installations (2,325 acres versus 6,425 acres in the proposed action) would be treated with rodenticides, thereby reducing the magnitude of some impacts. Disadvantages of this alternative are that a large reservoir of ground squirrels would remain in untreated areas, thereby providing a source of more immediate reinfestation on treated and adjacent areas. This high population would still represent a potential problem to public health.

Impacts. As was mentioned previously in the description of this alternative, a majority of the impacts in terms of scope will be comparable to those of the proposed action. The major differences instead will relate to the magnitude of the impact. In the following section those impacts varying in either scope or magnitude from the "Proposed Action" will be briefly discussed. Those impacts judged to be the same as in the "Proposed Action" will not be reiterated.

All impacts on human use areas will remain the same as described in the proposed action.

The following impacts may occur in buffer areas (open range):

Water Resources. The likelihood of any movement of 1080 or zinc phosphide into water resources will be very slight in those areas to be treated along the perimeter of Fort Hunter Liggett and Camp Roberts. Because zinc phosphide or 1080 will be distributed bordering only on agricultural land or around main cantonments or areas of military structure damage, the distance from the areas of application to any water body will be significantly less than in the proposed action.

Air Quality. Because less land will be aerially and hand treated, the amount of air pollutants from airplane and land vehicles will be significantly less. Air emissions for the Alternative 2 control program on Fort Hunter Liggett will be 75 percent less than under the proposed action and 54 percent less at Camp Roberts.

Terrestrial Fauna: Direct Poisoning - Target Species. Under Alternative 2, approximately 31 percent of the ground squirrel population will be controlled. High populations will continue to exist in grassland and woodland grass habitats away from the agricultural and human use areas. The eventual fate of this high population is unknown. It could continue to increase, with population dispersal into those areas treated, it could remain the same; or it could decrease as a result of natural causes, e.g., reduced fertility rate, disease (plague), etc. A more detailed discussion of population changes can be found under Alternative 3 - No Action.

In the area to be treated a greater percentage of the ground squirrel population is expected to survive the application of zinc phosphide as compared with the application of 1080 -- 60 percent as compared with 90-95 percent for 1080.

Terrestrial Fauna: Direct Poisoning - Nontarget Species. The magnitude of impact of Alternative 2 on nontarget species will be significantly less than that under the proposed action. Proportionately fewer individuals of the various nontarget species will be affected due to the smaller area of squirrel control.

A greater reduction in populations of seed-eating birds and small rodents within the 1 mile buffer zones may result from zinc phosphide than with 1080. A small percentage of rodent populations inhabiting the periphery of the treated areas will be reduced.

Populations of nontarget species in untreated open range areas will be unaffected.

Terrestrial Fauna: Secondary Poisoning - Nontarget Species. The smaller area of treatment will reduce the likelihood of secondary poisoning. Because most victims of secondary poisoning represent wide ranging species (coyotes, dogs, foxes, bobcats, etc.), there will continue to be some potential for nontarget poisoning. However, the fact that fewer ground squirrels will be available for consumption by predators may reduce the magnitude of the impact.

Economics. Costs of treating buffer zones will be: $3,487 for 1080 bait, and $4,650 for the pilot and airplane -- a total of $8,137. The grand total costs of treating Fort Hunter Liggett and Camp Roberts under Alternative 2 using 1080 will be $17,055. The grand total costs of using zinc phosphide, aerially applied, rather than 1080 would be $17,533. The costs of treating human use areas of all three installations as well as

the open range of Fort Ord will remain the same. Thus the total costs of Alternative 2 would be $17,055 (1080) bait and $17,753 (zinc phosphide bait) as compared with $31,455 for the proposed action and $33,383 for Alternative 1. If control is effective, it is estimated that annual repair and maintenance costs of approximately $5,500 on Fort Hunter Liggett alone would be saved. Costs of damage to agricultural crops on neighboring lands, possibly exceeding $175,000 per year, would be saved. Otherwise there will be no significant economic impact, since personnel used will be existing county, contractor and military personnel.

Alternative 3

Description. This option assumes that "no action" will be taken to control ground squirrels. Other programs and land use activities both on the military installations and adjoining lands are assumed to continue as at present.

Dynamics of Wildlife Populations Generally. The major factor governing the distribution and density of wildlife populations is the suitability of the habitat -- the combination of vegetation, soil and other environmental factors which enable various species of animals to live in a particular locality. If the conditions of the habitat are improved, the species will increase in number, but not excessively or continuously. There is an upper density threshold which cannot be surpassed no matter how much the environment is improved for that species.

The main criteria for wildlife survival are the suitability of the habitat and the ability of a species to adapt to environmental changes, such as those man has brought about on these military lands (roads, dams, buildings, introduction of exotic forbs and grasses, grazing by livestock, etc.). Some species, such as commensal rodents, ground squirrels, coyotes, English sparrows, starlings, and others, often produce abnormally high densities in man-modified environments, while most species actually decline in density when their habitat is altered by man.

In general, however, the upper limits in density of animal populations vary within relatively narrow limits in any particular habitat, due to a number of regulatory mechanisms that are not well understood. Factors that probably interact to limit excessive population build-ups include emigration, shelter, food supply, predation, diseases, social interactions and other vicissitudes of life, all of which can operate as stress factors on populations. Without these involuntary, density-dependent, self-limitation powers, overpopulation would become so acute as to destroy the species. Ground

squirrel populations always stop increasing when the equilibrium density, which is difficult to define precisely, is reached and triggers the various self-limiting population controls (Howard, 1965 and 1974; McLaren, 1971; and Krebs, et.al., 1973).

Population Dynamics of Ground Squirrels. Without control, there appears to be no question that the density of ground squirrels would continue to fluctuate from year to year. Since ground squirrels have but one litter a year, a fairly low reproductive potential compared to many other rodents and rabbits, their population fluctuations from year to year would not be as dramatic as occur with voles, rats, mice and some other species. The most dramatic fluctuations observed with various ground squirrel populations in the past have been their periodic decline locally, in man-altered environments, following periods of high numbers. The reasons for the declines have been attributed to various factors including diseases (plague, tularemia, and perhaps others) and food shortages. But the reason that rodent diseases found in California cannot be considered as effective biological control forces with any of the various kinds of native rodent species is because the disease outbreaks do not occur on a regular basis and they are all short-lived. Also, they affect, for the most part, only local populations of rodents and then only temporarily.

If diseases that are lethal to ground squirrels and other rodents remained highly virulent for many years, and also occurred simultaneously over very large regions, the affected species would soon be eliminated. Instead, after a disease outbreak occurs in rodents, which generally is quite localized, the affected populations usually recover in only a year or two. This usually is not because the number of survivors provides sufficient breeding potential to permit the population to quickly recover, but rather is due in part to the rapid reinvasion by individuals from neighboring areas that were not affected by the disease. It is the same reason why checkerboard-type control, where squirrels are controlled on some ranches and not on others, will have no lasting effect on the populations.

It appears highly unlikely that those ground squirrel populations considered high in 1976 will increase much further in the future without some form of intraspecific or other self-limiting population regulatory factors operating to bring about a leveling off with periodic, marked decline. There is an upper density threshold which cannot be surpassed no matter how favorable the environment is for that species. Therefore,

for purposes of considering the impacts of the no action alternative, it is assumed that the ground squirrel population densities will continue basically at present levels, recognizing that if a significant decline were to take place due to disease or other factors, the populations in such areas would recover in a matter of a few years.

Impacts. Since the population of ground squirrels is assumed to remain at the same level, the impacts which will result from "no action" will be essentially the same as discussed under the description of the ground squirrel damage problem in the present environment section. The main impact of "no control" will be the continued threat to human health because of the plague reservoir.

The effects of not controlling ground squirrels at Fort Ord would not be great, except along roads, the air strip, around buildings, and other areas where the soil and vegetation has been very much disturbed by man. The rest of Fort Ord has a lesser squirrel problem, and the impacts of no action on Fort Hunter Liggett and Camp Roberts would be quite similar on both bases. Therefore, the following discussion about the impacts of no action will apply primarily to both Fort Hunter Liggett and Camp Roberts.

Water. No action would have little effect on water except that the squirrel burrows may cause the stock pond dams to leak or to wash out.

Fauna. No action would mean that there would usually be very high populations of ground squirrels present. Such high populations would continue to compete with deer for acorns, forbs and grasses. The abundance of squirrels would increase the food base of predators that are known to feed on young squirrels. The density of predators is markedly affected by the availability of prey, even though the presence or absence of predators has much less effect on the population density of the prey species (Howard, 1974). Predation by squirrels, on the other hand, may have a detrimental effect on the nesting success of California valley quail, those mourning doves which build their nests on the ground, and perhaps other ground-nesting birds.

Flora. Most California range land forbs and grasses are such prolific seed producers that it is doubtful if the continued presence of uncontrolled ground squirrel populations would cause any plant species to become rare or endangered. But, due to the intensity of grazing from high squirrel

populations, no action would probably cause changes in density composition of forbs and grasses. The vegetation would not revert to its pristine composition even if all livestock grazing was discontinued and the ground squirrels were vigorously controlled.

Public health. Without artificial reduction of the ground squirrel populations, many of which are unnaturally dense because of man's historic manipulation of the forage and his other land use practices, it seems inevitable that periodic outbreaks of disease will occur as one of the natural population-controlling factors. Disease outbreaks will probably occur more frequently than is normal for ground squirrels because the modified habitats permit such high densities of squirrels.

Economics. Without ground squirrel control, problems that will continue are competition with livestock for forage and the types of damage reported earlier to adjacent crops, roads, airport runways, dams, and electric wiring; gnawing and undermining of buildings, and related problems. For several more years, at least, it is likely that additional burrows will be dug by squirrels in and around roads, dams and buildings, and in any new areas where such soil disturbance occurs.

The approximate cost of ground squirrel control as discussed under the proposed action is $31,455 Alternative 1, $33,383; and Alternative 2, $17,055 (1080), and $17,753 (zinc phosphide), and these amounts would be saved if there were no action. However, of course, the costs of damage to structures ($115,300) or to agricultural crops ($774,000) and the costs of annual repair and maintenance ($5,500 Fort Hunter Liggett) will remain.

Social Problems. If the unusually high populations of squirrels are permitted to remain indefinitely, except for the natural fluctuations in density that will occur, the surrounding communities, especially the immediate landowners, will object to the military areas not being subjected to the same ground squirrel control regulations private citizens have to follow. There will be more hard feelings among neighbors who will find it much more complicated and expensive to keep their squirrels under control, since their lands will be quickly reinvaded by squirrels from military property. On the other hand, some persons may find that any increase in squirrel numbers actually makes these lands more interesting.

Agricultural Crops. If the ground squirrels are not controlled, they will continue to do damage to cereals and other crops grown on or adjacent to the military lands.

Livestock grazing. No action would perpetuate the economic loss to livestock operations due to the competitive grazing by ground squirrels and the reduction in carrying capacity for livestock.

Military missions. In addition to the many economic problems stated above, a no-action course may periodically jeopardize military use of much of the training grounds if plague occurs in dense populations of ground squirrels.

Recreation. The periodic hazard of plague resulting from no action would require frequent closure of portions of these lands now used for recreation purposes. For a more detailed statement of recreational impacts, see Appendix I.

Air. No effect on air quality.

Energy. More fuel energy would probably be required to repair the damage caused by dense populations of squirrels than would be expended in controlling them every third year or so, but the difference cannot be very significant. Some of the energy expended to plant agricultural crops may be wasted if crops are damaged due to ground squirrels.

Transportation. If no action were taken, less transportation (i.e. movement of control materials, etc.) would be required, but again this difference is of little significance.

Soils. No action would have little effect. Most erosion that occurs as a consequence of digging by squirrels is along roads, in dams and around buildings. Another type of erosion which occurs on some range lands is most severe where woody vegetation has been removed and when rainwater gets channeled from a road or a livestock trail down a burrow, causing subsurface erosion. Once the top caves in, a gulley is formed (Longhurst, 1957). This type of erosion, however, is not common on these military lands.

Summary of Economic Impacts. The following table represents a summary of the approximate costs of rodenticide and insecticide use on the Fort Ord complex under the proposed action, Alternative 1 and Alternative 2.

Installation	Open Range $ Cost	Human Use Areas Ground Squirrel Control	$ Cost Flea Control	Total $ Cost
PROPOSED ACTION:				
Fort Ord	693	370	225	1,288
Fort Hunter Liggett	15,712	2,690	1,125	19,527
Camp Roberts	6,825	2,690	1,125	4,640
Total	23,230	5,750	2,475	31,455
ALTERNATIVE I:[1]				
Fort Ord	693	370	225	1,288
Fort Hunter Liggett	17,055	2,690	1,125	20,870
Camp Roberts	7,410	2,690	1,125	11,225
Total	25,158	5,750	2,475	33,383
ALTERNATIVE II:[2]				
Fort Ord	693[1]	370	225	1,288
Fort Hunter Liggett	4,725	2,690	1,125	8,540
Camp Roberts	3,413	2,690	1,125	7,228
Total	8,830	5,750	2,475	17,055
ALTERNATIVE II:[1]				
Fort Ord	693[2]	370	225	1,288
Fort Hunter Liggett	5,130	2,690	1,125	8,945
Camp Roberts	3,705	2,690	1,125	7,520
Total	9,528	5,750	2,475	17,753

[1] Zinc phosphide

[2] 1080

Summary of Environmental Impacts

The following discussion represents a brief summary of: 1) the alternatives as they relate to the project objectives, 2) a comparative evaluation of the alternatives relative to the acreage to be treated, and 3) a short summary of the impacts for each alternative.

Project Objectives

The project objectives have been mentioned often throughout this report. The following table shows how the proposed action and the three alternatives relate to the project objectives:

Action on Ground Squirrel Control	Effectiveness in Minimizing Threats to Human Health	Effectiveness in Minimizing Damage to Adjacent Crops	Effectiveness in Minimizing Damage to Military Facilities
Proposed Action	x	x	x
Alternative 1	xx	xx	xx
Alternative 2	xxx	xxx	xxx
Alternative 3 (no action)	xxxx	xxxx	xxxx

x Good overall solution based on present information and proven technology. Probable 90-95% effectiveness.
xx Less effective than the proposed action due to the probable lower efficacy (60%) of zinc phosphide.
xxx Effective, but with the major drawback of constant reinvasion of ground squirrels from untreated areas.
xxxx Doubtful value.

Acreage of Treatment

The following table summarizes the acreage of potential squirrel habitat (oak woodland and grassland) vs. the actual acreage to receive treatment under the various alternatives.

	Aerial Treatment		Hand Treatment	
	Potential Squirrel Habitat*	Actual Acreage Upon Which Bait Will be Placed	Potential Habitat	Actual Acreage to be Treated
PROPOSED ACTION:				
Fort Ord	NC	NC	11,500	2,800
Fort Hunter Liggett	89,500	4,475	4,000	UK
Camp Roberts	39,000	1,950	3,000	UK
ALTERNATIVE 1:				
Fort Ord	NC	NC	NC	NC
Fort Hunter Liggett	89,500	4,475	4,000	UK
Camp Roberts	39,000	1,950	3,000	UK
ALTERNATIVE 2:				
Fort Ord	NC	NC	NC	NC
Fort Hunter Liggett	27,000	1,350	4,000	UK
Camp Roberts	19,300	975	3,000	UK
ALTERNATIVE 3:				
No action	0	0	0	0

* Also represents acreage to be flown.

NC Not considered in alternative.

UK Unknown.

Environmental Impacts

This table briefly summarizes the impacts of the proposed action and various alternatives. Because this represents only a summary, it does not include a discussion of the magnitude of each impact relative to individual species of animals. The detailed discussion of these features appears in the main body of this impact chapter. The numbers assigned to represent the magnitude of the impact resulting from the proposed action and alternative should be considered on the basis of whether or not the impact affects man's environment.

Impacts resulting from pest control in human use areas (Alternatives 1 and 2) are the same as those in the proposed action. However, the effectiveness of pest control in human use areas may be considerably reduced because of reinvasion of ground squirrels from untreated or less effectively treated adjacent lands.

The numbers are for comparison purposes only and do not necessarily represent any absolute values, and therefore cannot be summed.

Environmental Elements	Proposed Action		Alternative 1		Alternative 2		Alternative 3	
	Open Range	Human Use Area	Open Range	Human Use Area	Open Range	Human Use Area	Open Range	Human Use Area
Water resources	0	0	0	0	0	0	0	0
Target species	+4	+4	+3	+4	+2	+4	0	0
Primary poisoning of nontarget species	-1	-1	-1	-1	0	-1	0	0
Secondary poisoning of nontarget species	-1	-1	0	-1	0	-1	0	0
Rare and endangered species	-1	0	-1	0	-1	0	0	0
Aquatic fauna	0	0	0	0	0	0	0	0
Cumulative effects	0	0	0	0	0	0	0	0
Flora	0	0	0	0	0	0	0	-2
Public health:								
a) Safety and health	-1	-1	-1	-1	-1	-1	-2	0
b) Plague control	+4	+4	+3	+4	-1	+4	0	-4
Economics:								
a) Treatment costs	-2	-3	-2	-3	+2	-3	-4	0
b) Damage costs	+3	+4	+2	+4	-1	+4	-4	-4
Land use	-1	0	-1	0	-1	0	-1	-2
Transportation	-1	0	-1	0	-1	0	0	0
Noise	-1	0	-1	0	-1	0	0	0
Air quality	-1	0	-1	0	-1	0	0	0
Soils	0	0	0	0	0	0	0	0
Energy	-1	0	-1	0	-1	0	0	0

Key:

0 No impact
1 Minor impact
2 Low impact
3 Moderate impact
4 Major impact

+ Beneficial to environmental element
- Adverse to environmental element

Consideration of Land Use Relationships in Reference to the Proposed Actions and Alternatives

The land use relationship section (Legal, Policy and Institutional Constraints) lists a number of laws, regulations and policies which may in some way act as a constraint on the proposed action. Many are important in assuring that the project, if carried out, will be done in an environmentally-sound manner. Several, however, warrant specific attention in consideration and selection of the ground squirrel control methods to be used.

Regarding the use of compound 1080, which is proposed for use in the proposed action and is also considered as one option under Alternative 2, the authority to use this chemical during 1977 is questionable -- and it is difficult to predict when a decision regarding its use may be made.

On December 1, 1976, EPA placed compound 1080 and 1081 on its rebuttal presumption list and provided 45 days for responses prior to making a determination whether continued use would be allowed. It is reported the response period has been extended 60 days and it is possible additional extensions may follow to allow further EPA investigations.

In addition, of course, the use of compound 1080, under the proposed action or as an option in Alternative 2, will require completion of action by the Army in obtaining an exemption from Executive Order 11870, which prohibits use of chemicals with secondary poisoning possibilities on federal lands.

Regarding public health, the Army Surgeon General, with support from the California Department of Public Health, has determined that the large ground squirrel population at the Fort Ord complex does represent a significant public health threat, and that ground squirrel control (coincident with flea control) should be undertaken in areas of substantial human activity. This situation should be given careful attention when considering Alternative 3 -- the alternative under which no action would be taken to control ground squirrels.

Finally, and perhaps not of serious concern in consideration of the alternatives, the Monterey County Ordinance 328 (November 2, 1908) would be in conflict with Alternative 3 -- no action. It provides for fines (with half of the fine to the informant) or imprisonment for failure to act in good faith to exterminate, kill or destroy any ground squirrels in Monterey County.

PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

In the event that the proposed action is implemented, a number of unavoidable adverse environmental impacts may occur. The use of rodenticides will result in approximately an 60-90 percent reduction in the beechey ground squirrel population of the Fort Ord Complex. In turn, this reduction in squirrel numbers will mean some reduction in available prey for carnivores, raptorial birds and some reptiles.

The proposed rodenticides may also result in some primary poisoning losses of nontarget wildlife, such as rodents, seed-eating birds, and wildlife that inhabit ground squirrel burrows (burrowing owls, snakes, lizards and toads). Several of the proposed rodenticides and Carbaryl may adversely affect some species of beneficial terrestrial invertebrates.

Some secondary poisoning losses to individuals of the cat family (i.e., bobcat) and dog family (i.e., coyote), including kit foxes, may occur due to consumption of ground squirrel carcasses that may be exposed above ground.

Fuel and some materials will be consumed to implement the ground squirrel control program.

Many unavoidable environmental impacts can be minimized by judiciously following the laws and regulations governing rodenticide use. By following recommended application rates and procedures, bait will be exposed in a manner least detrimental to nontarget species. Careful planning of the ground squirrel program will eliminate wastage of fuel, labor and materials.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The proposed action would result in an immediate and efficient reduction in the number of ground squirrels now populating the Fort Ord military complex. The short-term gain would be: 1) a reduction in the public health hazard (plague) resulting from the ground squirrel's role as a flea host in the transmission of plague from wild rodent reservoirs to humans via the bites of infective fleas; 2) an increase in the productivity of the leased rangelands now being grazed by cattle and sheep; 3) a reduction in the damage now being done to military structures and facilities, which cost an estimated $5,500 per year to repair and maintain on Fort Hunter Liggett alone; and 4) a reduction in crop damage on neighboring ranches, damage which has been estimated to total $700,000+ during 1972-76.

The long-term environmental losses would be in the area of unavoidable adverse impacts upon nontarget species particularly other rodents, carnivores and birds.

Some domestic cats and dogs may be lost in those areas where uncontrolled pets are permitted to run loose in areas where dead rodents containing 1080 or zinc phosphide may be consumed. The kit fox may experience some loss for the same reason. Some coyotes may be lost in the areas treated. Some seed-eating nontarget rodents and possibly birds may be lost.

The losses of these species will be minimal, and in no case will result in a long-term effect upon the populations of species other than the target species.

The greatest potential for secondary loss will be to the San Joaquin kit fox. On Fort Hunter Liggett no kit fox dens have been identified. On Camp Roberts only one den has been identified, but the area within one mile of any identified den will not be treated with 1080; therefore, the possibility, though it exists, may be reduced to a minimum if all necessary precautions are followed.

To achieve long-term gains, a repeated control of the ground squirrel population may be necessary, probably every 2 to 3 years with 1080, and every year or possibly every two if zinc phosphide is used, since the ground squirrel residual number will always be sufficient to repopulate the area within that period of time. Other methods may be used if monitoring or research indicates unacceptable impacts from 1080 or zinc phosphides. There will be some reduction in the food base for mammalian and avian predators, resulting from reduced populations of the ground squirrel and nontarget rodents.

The most probable long-term effects will be those associated with a reduction in the competition for forage with other wildlife and with cattle and sheep.

A reduction in ground squirrel numbers will provide the opportunity to maintain at least the same number of grazing livestock on a given area, and to thereby provide an opportunity for range conditions to improve where overstocking or overutilization now exist.

In no case does it appear that any future options will be foreclosed since the proposed action will not eliminate any wildlife species (including the target species), and will not add any material to the environment, nor change the environment in a way which would prevent any future options from being implemented.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Other than the consumption of fuel and materials, or the death of individual animals, there will be no irreversible or irretrievable commitment of resources.

NATIONAL DEFENSE CONSIDERATIONS THAT MUST BE BALANCED AGAINST THE ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

The benefits of the proposed action will be:

1. Reduced public health hazard (plague) existing on the Fort Ord military complex.

2. Reduced damage to crops on adjacent private land.

3. Reduced damage to military structures and facilities.

4. Reduced competition with grazing livestock, with consequent improvement in productivity.

The benefits of alternatives to the proposed action will be as follows:

Alternative 1. Similar to the proposed action, except that ground squirrel control method costs will be slightly greater ($1,928), and that the efficiency of zinc phosphide (60 percent) may be considerably less than that of 1080 (90 percent).

Alternative 2.

1. Reduced public health hazard (plague) existing on the Fort Ord military complex.

2. Reduced damage to crops on adjacent private land.

3. Reduced damage to military structures and facilities.

4. Somewhat lesser reduction of competition with grazing livestock than would be accomplished through the implementation of the proposed action -- due to the significantly fewer acres of grazing land which would be subject to ground squirrel control.

5. Fewer losses of nontarget species because of the reduced area treated.

6. Approximately $14,000 lower cost of ground squirrel control.

Alternative 3. No benefits will be obtained, except that no loss of nontarget species due to ground squirrel control will occur.

GLOSSARY

ACRE-FOOT -- A water or sediment volume measurement term, equal to the amount of water which would cover an area of one acre to a depth of one foot, i.e., 43,560 cubic feet or 325,828 gallons.

ACUTE TOXICITY -- Rapid damage to an organism by the fastest acting mechanism of poisoning, fatal unless the organism escapes the toxic environment at an early stage.

AESTIVATION -- A period of dormancy during the summer.

ALLUVIUM -- Material, including clay, silt, sand, gravel and mud, deposited in riverbeds, lakes, alluvial fans, valleys and elsewhere by modern streams.

ANGLER DAY -- One angler day equals one fisherman fishing for any part of one day.

ANIMAL UNIT (AU) -- An animal unit is widely accepted as a mature cow with calf, or their equivalent, horses, sheep and goats commonly are converted to animal units at the rate of 1.25, 0.2, and 0.17, respectively.

ANIMAL UNIT MONTH (AUM) -- The amount of forage required by an animal unit for one month of grazing.

ANTICOAGULANTS -- Multiple dose rodenticides used widely for commensal and field rodent control. They reduce the clotting ability of the blood and cause damage to the capillaries. They may cause death if consumed in sufficient quantity over a period of days.

AQUIFER -- Water bearing, porous rock or sand and gravel formation yielding a usable quantity of water.

BLOCKED FLEAS -- Can be defined as fleas having their stomachs and/or proventriculi blocked through a great multiplication of the plague bacilli originally ingested. Because of this blockage, blood meals may overfill the fleas esophagus and cause the blood to be driven back into the bite wound of the host (Pollitzer, 1954).

BUBONIC PLAGUE -- See plague.

CARRYING CAPACITY -- The number (or weight) of organisms of a given species and quality that can survive in, without causing deterioration of, a given ecosystem through the least favorable environmental conditions that occur within a stated interval of time.

CHEMICAL TOXICANT -- Any chemical substance which when ingested, inhaled, or absorbed, or when applied to or injected into the body, in relatively small amounts, by its chemical action may cause significant bodily malfunction, injury, illness, or death, to animals or to man.

CHEMO-STERILANT -- A chemical that can cause temporary or permanent sterility in either or both sexes or, through some other physiological aspect reduce the number of offspring or alter the fecundity of the offspring produced.

CHRONIC TOXICITY -- May influence the ability of the organism to reproduce, grow, or behave normally, but probably is not often a direct cause of death in nature.

COMMENSAL -- Of or relating to those who habitually eat together.

COMMUNICABLE DISEASE -- An illness due to a specific infectious agent or its toxic products, which arises through transmission of that agent or its product from a reservoir to a susceptible host -- either directly, as from an infected person or animal, or indirectly, through the agency of an intermediate plant or animal host, vector, or the inanimate environment.

DORMANT -- Marked by a suspension of activity.

ECOSYSTEM -- The system formed by the interaction of a group of organisms and their environment.

EDGE EFFECT -- The effect upon wildlife occurring where the types of food and cover needed by wildlife come together, i.e., where habitat edges meet.

ENDEMIC -- A taxonomic category (e.g., genus, species) whose natural occurrence is confined to a certain region and whose distribution is relatively limited.

ENZOOTIC -- A disease present in the population at all times.

EPHEMERAL STREAM -- A stream or portion of a stream that flows only in direct response to precipitation. It receives little or no water from springs and no long-continued supply from snow or other sources.

EPIDEMIC -- Attacking many people in any region at the same time; widely diffused and rapidly spreading.

EPIZOOTIC -- High morbidity usually accompanied by high mortality spreading rapidly.

EROSION -- The group of processes whereby earthy or rock material is worn away. Loosened or dissolved and removed from any part of the earth's surface.

EVISCERATE -- To take out the entrails, to disembowel.

FEBRILE -- Of or relating to a fever.

FAULT, ACTIVE -- A linear break in the earth's surface that has undergone movement in recent geologic time (the last 10,000 years) and may be subject to future movement.

FAUNA -- The animal life of an area, "animal" being used in the broad sense to include birds, fish, reptiles, insects, molluscs, crustaceans, etc., in addition to mammals.

FEDERAL LANDS -- All real property owned by or leased to the federal government, excluding (1) lands administered by the Secretary of the Interior pursuant to his trust responsibilities for Indian affairs, and (2) real property located in metropolitan areas.

FLORA -- The plant life of an area.

FORAGE -- All browse and nonwoody plants that are available to livestock or game animals and used for grazing or harvested for feeding.

FOSSORIAL -- Adapted for digging.

GESTATION PERIOD -- The period from fertilization to birth.

GROUNDWATER -- Water within the earth that supplies wells and springs. Specifically, water in the zone of saturation where all openings in soils and rocks are filled -- the upper surface of which forms the water table.

HABITAT -- The natural place of abode of a plant or other organism. The locality where the organism may generally be found, and where all essentials for its development and existence are present.

HIBERNATION -- A state of inactivity and torpidity during the winter. The body temperature falls until it is barely above that of the environment; the breathing rate decreases; the the heartbeat rate is reduced.

HUNTER DAY -- One hunter day equals one hunter hunting for any part of one day.

INTERMITTENT STREAM -- Streams which, in general, flow during wet seasons and are dry during dry seasons.

LETHAL DOSE (LD_{100}) -- The amount or concentration of a toxic substance which will result in the death of 100 percent of a group of test organisms upon exposure (by ingestion, application, injection or in their surrounding environment) for a specified period of time.

MEDIAN LETHAL DOSE (LD_{50}) -- The amount or concentration of a toxic substance which will result in the death of 50 percent of a group of test organisms upon exposure (by ingestion, application, injection or in their surrounding environment) for a specified period of time.

MORBIDITY -- The relative incidence of a disease.

MORTALITY -- The number of deaths in a given time or place.

OPEN RANGE -- All suitable range of an area upon which grazing is permitted.

PLAGUE -- An acute febrile disease caused by a bacillus yersinia (Pasteurella) pestis, with fleas as vectors. The term bubonic plague is sometimes used to designate a case contacted from wild (sylvatic) rodent or commensal (urban) rat sources.

PRIMARY POISON -- The result attributable to a chemical toxicant, which after being ingested, inhaled or absorbed or when applied to or injected into a mammal, bird, reptile or fish, causes significant bodily malfunction, injury, illness or death.

RANGE CONDITION -- The state and health of the range based on what it is naturally capable of producing.

RANGELAND -- Land on which the (climax or natural potential) plant community is dominated by grasses, grass-like plants, forbs, or shrubs suitable for grazing or browsing and present in sufficient quantity to justify grazing or browsing use. Includes rangelands revegetated naturally or artificially to provide cover that is managed like native vegetation.

RANGE MANAGEMENT -- The art and science of planning and directing range use to obtain sustained maximum animal production, consistent with perpetuation of the natural resources.

RAPTOR -- A bird of prey.

RECHARGE -- The addition of water to an aquifer that occurs naturally from infiltration of rainfall and from water flowing over earth materials that allow water to infiltrate below the land surface.

RESERVOIR -- An organism in which a parasite that is pathogenic for some other species lives and multiplies without damage to its host.

RIPARIAN -- In loose usage, referring to the land bordering a stream, lake, or tidewater.

RODENTICIDE -- A chemical substance used for the destruction of rodents, generally through ingestion.

SECONDARY POISONING -- The result attributable to a chemical toxicant which, after being ingested, inhaled, or absorbed, or when applied to or injected into a mammal, bird, reptile or fish, is retained in its tissue, or otherwise retained in such a manner and quantity that the tissue itself or retaining part, if thereafter ingested by man, mammal, bird, reptile or fish, causes significant bodily malfunction, injury, illness, or death to animals or to man.

SODIUM MONOFLUOROACETATE - 1080 -- A white, stable, water soluble, practically tasteless, crystalline compound. 1080 is metabolized to highly toxic fluorocitrate, causing death by cardiac and/or central nervous system failure.

SOIL ASSOCIATION -- A group of defined and named soil taxonomic units occurring together in an individual and characteristic pattern over a geographic region.

SOIL SERIES -- Soils which have similar soil profile characteristics and which are derived from similar parent materials.

SURFACE WATER -- Water which remains on top of the land, such as a river or lake.

VECTOR -- An organism (as an insect) that transmits a pathogen.

ZOONOSIS -- Disease condition affecting both man and animal.

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PERSONAL COMMUNICATIONS

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Train, Russell [letter]

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Broadfoot, Mr. Agricultural spray and pest control pilot, Paso Robles, California

APPENDIX A

FLORA OF THE STUDY AREA

Common Name	Scientific Name	Fort Ord*	Fort Hunter Liggett, Camp Roberts**
TREES			
Arroyo willow	Salix lasiolepis	x	x
Big leaf maple	Acer macrophyllum		x
Black cottonwood	Populus trichocarpa	x	x
Blue oak	Quercus douglasii		x
Bluegum***	Eucalyptus golbulus		x
Bristlecone fir	Abies bracteata		x
California bay	Umbellularia californica		x
California buckeye	Aesculus californica		x
California sycamore	Platanus racemosa	x	x
Canyon live oak	Quercus chrysolepsis		x
Coast live oak	Quercus agrifolia	x	x
Coulter pine	Pinus coulteri		x
Digger pine	Pinus sabiniana		x
Fremont cottonwood	Salix fremontii		x
Gowan cypress	Cupressus goveniana		x
Incense cedar	Libocedrus decurrens		x
Interior live oak	Quercus wislizenii		x
Knobcone pine	Pinus attenuata		x
Monterey pine	Pinus radiata	x	
Pacific bayberry	Myrica californica		x
Pacific madrone	Arbutus menziesii		x
Pacific willow	Salix lasiandro		x
Ponderosa pine	Pinus ponderosa		x
Red alder	Alnus rubra		x
Red willow	Salix laevigata		x
Tan oak	Lithocarpus densiflorus		x
Valley oak	Quercus lobata		x
Black sage	Salvia mellifera	x	x
Blue blossom	Ceanothus thyrsiflorus	x	x
Blue elderberry	Sambuscus caerulea	x	x
Blue witch	Solanum umbelliforum		x
Brewer willow	Salix breweri		x
Buck brush	Ceanothus cuncatus		x
Bush poppy	Dendromecon rigida		x
California blackberry	Rubus vitifolius	x	
California bush buckwheat	Eriogonum fasciculatum		x
California coffeeberry	Rhamnus californica		x
California sagebrush	Artemisia californica	x	x
California scrub oak	Quercus dumosa		x
California wild rose	Rosa californica	x	x
Canyon gooseberry	Ribes menziesii		x
Cascara sagrada	Rhamnus purshiana		x
Chamise	Adenostoma fasciculatum	x	x
Chaparral currant	Ribes malvaceum	x	
Chaparral pea	Pickeringia montana		x
Chaparral whitethorn	Ceanothus lencodermis		x
Chinquapin	Castanopsis chrysophylla var. minor		x
Coast silktassel	Garrya elliptica	x	
Coast whitethorn	Ceanothus incanus	x	
Common snowberry	Symphoricarsus albus		x
Coyote brush	Baccharis pilularis ssp. consanguinea	x	x
Creeping sage	Salvia sonomensis		

Common Name	Scientific Name	Fort Ord*	Fort Hunter Liggett, Camp Roberts**
Deer brush	Ceanothus integerrimus		x
Deer weed	Lotus scoparius	x	x
Dwarf ceanothus	Ceanothus dentatus	x	
Eastwood manzanita	Arctostaphylos glandulosa		x
Eastwood's ericamerica	Happlopappus eastwoodae	x	
Flannelbush	Fremontia californica		x
Fuchsia flowered gooseberry	Ribes speciosum		x
Golden yarrow	Eriophyllum confertiflorum	x	
Hillside gooseberry	Ribes californicum		x
Hollyleaf redberry	Rhamnus crocea var. ilicifolia		x
Mock heather	Happlopappus ericoides	x	
Monterey ceanothus	Ceanothus rigida	x	
Monterey manzanita	Arctostaphylos hookeri	x	
Pitcher sage	Lepechinia calycina	x	
Poison oak	Rhus diversiloba		x
Purple sage	Salvia leucophylla		x
Rabbit brush	Chrysothamus nauseasus		x
Sandmat manzanita	Arctostaphylos pumila	x	
Shaggy bark manzanita	Arctostaphylos tomentosa		
	var. crustacea	x	
	var. tomentosa	x	
	var. tomentosiformes	x	
	var. trichoclada	x	
	var. hebeclada	x	
Squaw bush	Rhus trilobato		x
Tibinagua	Eriogonum nudum	x	
Toro manzanita	Arctostaphylos montereyensis	x	
Toyon	Heteromeles arbutifolia	x	x
Twinberry	Lonicera involucrata		x
Valley willow	Salix hindsiana		x
Wavyleaf ceanothus	Ceanothus foliosus		x
Western chokecherry	Prunus virginia var. deniosa		x
Western mountain mahogany	Cercocarpus betuloides		x
Western service berry	Amlanchler alnifolia		x
White sage	Salvia apiana		x
Whiteleaf yerba santa	Eriodictyon crassifolium		x
Yerba santa	Eriodictyon californicum	x	x
HERBACEOUS VEGETATION			
Annual bluegrass	Poa annua		x
Annual foxtail barley	Hordeum laporinum		x
Annual ryegrass	Lolium multiflorum		x
Arenaria	Arenaria californica		x
Baby blue eyes	Nemaphila menziesii	x	x
Beach aster	Corethrogyne leucophylla	x	
Beach-bur	Franseria chamissonis ssp. bipinnatisecta	x	
Beach burr	Ambrosia chamissonis	x	
Beach morning glory	Convolvulus soldanella	x	
Beach pea	Lathyrus littoralis	x	
Beach poppy	Eschscholtzia maritima	x	
Beach primrose	Oenothera cheiranthifolia	x	
Beach ryegrass	Elymus mollis	x	
Beach sagewort	Artemisia pycnocephala	x	
Bedstraw	Galium spp.		x
Ben Lomond wallflower	Erysimum teretifolium	x	
Bermuda grass	Cynodon dactylon		x

Common Name	Scientific Name	Fort Ord*	Fort Hunter Liggett, Camp Roberts**
Bindweed	Convolvulus arvensis		x
Bitterroot	Lewisia rediviva		x
Black mustard***	Brassica nigra	x	
Bladder parsnip	Lomatium utriculatum	x	
Blow-wives	Archyracheena mollis		x
Blue dicks	Brodiaea capitata		x
Blue dicks	Brodiaea jolonensis		x
Blue wild rye	Elymus glaucus		x
Blue-eyed grass	Sisyrinchium bellum	x	x
Bluegrass	Poa bulbosa		x
Bluegrass	Poa scabrella		x
Branching phacelia	Phacelia ramosissima var. montereyensis	x	
Bracken fern	Pteridium aquilnum	x	
Buckwheat	Eriogonum spp.		x
Bull thistle	Cirsium vulgare	x	x
Bulrush	Scirpus spp.		x
Bush lupine (yellow)	Lupinus arboreus	x	
Bush lupine (purple)	Lupinus chamissonis	x	
Burclover	Medicago polymorpha		x
Buttercup	Ranunculus spp.		x
California brome	Bromus carinatus		x
California buttercup	Ranunculus californicus	x	
California fescue	Festuca californica		x
California poppy	Eschscholtzia californica	x	x
California water starwort	Callitriche marginata	x	
Canary grass	Phalaris tuberosa		x
Carmel Valley bush-mallow	Malacothamnus palmeri var. involucratus		x
Catchfly	Silene spp.		x
Cattail	Typha latifolia	x	x
Centaury	Centaurium muhlenberaii		x
Checkerbloom	Sidalcea malvaeflora	x	x
Chia	Salvia columbariae	x	
Chickweed	Cerastium viscosum		x
Chinese houses	Collinsia heterophylla	x	
Climbing bedstraw	Galium nutallii	x	
Clover	Trifolium ciliolatum		x
Clover	Trifolium variegatum		x
Clover	Trifolium hirtum		x
Clover	Trifolium depauperatum		x
Clover	Trifolium microcephalum		x
Clover	Trifolium albopurpureum		x
Clover	Trifolium microdon		x
Coast buckwheat	Eriogonum latifolium	x	
Coast figwort	Scrophularia californica	x	
Coast larkspur	Delphinium patens	x	
Coast parsnip	Lomatium parvifolium	x	
Coast wallflower	Erysimum ammophilum	x	
Cobweb thistle	Cirsium occidentale	x	
Common manroot	Marah fabaceus	x	
Common plantain***	Plantago major	x	x
Cream cups	Platystemon californica	x	x
Curly leafed monardella	Monardella undulata	x	
Cut-leaf filaree	Erodium cicutarium		x
Death camas	Zygadenus spp.		x
Douglas iris	Iris douglasiana	x	
Dune bluegrass	Poa douglasii	x	
Dune buckwheat	Eriogonum parvifolium	x	
Euphorbia	Euphorbia ssp.		x
European beach grass***	Ammophila arenaria	x	
Fescue	Festuca reflexa		x
Fescue	Festuca pacifica		x
Fescue	**Festuca dertonensis**		x

Common Name	Scientific Name	Fort Ord*	Fort Hunter Liggett, Camp Roberts**
Fiddleneck	Amsinckia spp.		x
Fiesta flower	Pholistum auritum	x	
Filago	Filago californica		x
Filaree	Erodium spp.	x	x
Foxtail barley	Hordeum jubatum		x
Foxtail fescue	Festuca megalura		x
Foxtail grass	Hordeum leporinum	x	
Gambleweed	Sanicula crassicaulis	x	
Geranium	Geranium spp.		x
Giant ryegrass	Elymus condensatus	x	
Gilia	Gilia tricolor		x
Goldback fern	Pityrogramma triangularis	x	
Goldenbrodiaea	Brodiaea lutea	x	
Goldfields	Bacria chrysostoma	x	x
Grindelia	Grindelia latifolia	x	
Hardham bedstraw	Galium hardhamae		x
Hedge nettle	Stachys bullata	x	
Heliotrope	Phacelia douglasii	x	
Hickman sidalcea	Sidalcea hickmanii ssp. hickmanii		x
Hill clarkia	Clarkia bottae	x	
Horsetail	Equisetum spp.	x	
Ice plant	Mesambryanthemum chilensis	x	
Ice plant***	Mesambryanthemum edulis	x	
Indian Valley chorizanthe	Chorizanthe insignis		x
Indian warrior	Pedicularis densiflora	x	
Italian ryegrass***	Lolium multiflorum	x	
Johnny-jump-up violet	Viola pedunculata	x	
Junegrass	Koeleria cristata		x
Kentucky bluegrass	Poa pratensis		x
Large cut-leaf filaree	Erodium moschatum		x
Large-flowered linanthus	Linanthus grandiflorus	x	x
Larkspur	Delphinium variegatum		x
Little quakegrass	Eriza minor		x
Lizardtail	Eriophyllum staechadifolium	x	
Locoweed	Astralagus spp.		x
Lupine	Lupinus tricolor		x
Lythrum	Lythrum hyssopifolia	x	
Mediterranean barley	Hordeum hystrix		x
Melic grass	Melica imperfecta		x
Milkmaids	Dentaria californica	x	
Milkweed	Ascelpias spp.		x
Miner's lettuce	Montia perfoliata	x	x
Mint	Stachys spp.		x
Monkey flower	Mimulus spp.		x
Monterey spine flower	Chorizanthe pungens	x	
Mugwort	Artemisia douglasiana	x	
Mullein	Verbascum thapsis		x
Narrow-leafed wooly mule ears	Wyethia angustifolia	x	
Navarretia	Navarretia spp.		x
Neddlegrass	Stipa lepida		x
Neddlegrass	Stipa cernua		x
Oatgrass	Danthonia californica		x
One-awned spine flower	Chorizanthe rectispina		x
Orchard grass	Dactylis glomerata		x
Owls clover	Orthocarpus densiflorus	x	
Pampas grass***	Cortaderia atacamensis	x	
Pearly everlasting	Anaphalis margaritacea	x	
Pepper grass	Pipidium nitidum		x
Pimpernel	Anagallis arvensis		x
Popcorn flower	Plagiobothrys nothofulvus		x

Common Name	Scientific Name	Fort Ord*	Fort Hunter Liggett, Camp Roberts**
Purple needlegrass	Stipa pulchra	x	x
Rabbitfoot grass	Polypogon monspeliensis		x
Red brome	Bromus rubens		x
Red-stem filaree	Erodium botrys		x
River cinquefoil	Potentilla rivalis	x	
Ripgut brome	Bromus rigidus		x
Ripgut grass***	Bromus diandrus	x	
Rush	Juncus spp.	x	x
Ryegrass	Lolium perrene		x
Sand lotus	Lotus heermanii	x	
Sand verbena (pink)	Abronia umbellata	x	
Sand verbena (yellow)	Abronia latifolia	x	
Sanicle	Sanicula spp.		x
Santa Lucia pogogyne	Pogogyne clareana		x
Sea lettuce	Dudleya caespitosa	x	
Sea rocket***	Cakile maritima	x	
Seaside bird's beak	Cordylanthus littoralis	x	
Seaside painted cup	Castilleja latifolia	x	
Sedge	Carex spp.	x	x
Shepard's purse	Capsella bursa-pastoris		x
Shooting star	Dedecatheon clevelandii var. patulum		x
Short-lobed phacelia	Phacelia brachyloba	x	
Shower of Gilia	Linanthus androsacens	x	
Silver hairgrass	Aira caryophyllea		x
Silver lupine	Lupinus albifrons	x	x
Sky lupine	Lupinus nanus	x	x
Slender flowered gilia	Gilia tenuiflora ssp. arenaria	x	
Slender oats***	Avena barbata	x	x
Soap plant	Chlorogalum purpureum var. purpureum		x
Soap root	Chlorogalum pomeridianum	x	x
Soft chess	Bromus mollis	x	x
Sorrel	Rumex spp.		x
Spurge	Croton californica	x	
Squirrelgrass	Sitanion hystrix		x
Star lily	Zigadenus fremontii	x	
Sticky monkey flower	Diplaucus aurantiacus	x	
Swamp knotweed	Polygonum coccineum	x	
Tarweed	Madia spp.		x
Tarweed	Hemizonia spp.		x
Tidy tips	Layia platyglossa	x	
Tocalote	Centaurea militensis		x
Trefoil	Lotus subpinnatus		x
Turkey mullien	Bremocarpus setigerus		x
Umbrella sedge	Cyperus spp.		x
Verbana	Verbana lasiostachys	x	
Verbena	Verbena bracteata	x	
Vetch	Vicia spp.		x
Vinegar weed	Trichostema spp.		x
Virgala eriastrum	Eriastrum virgatum	x	
Wedge-leaf horkelia	Horkelia cuneata	x	
Western dog violet	Viola adunca	x	
Western poppy	Papaver californicum	x	
White globe lily	Chalochortus albus	x	
White owls clover	Orthocarpus purpureus var. pallidus	x	x
Wild carrot	Daucus pusillus		x
Wild geranium	Geranium dissectum	x	
Wild hyacinth	Brodiaea pulchella	x	x
Wild iris	Iris spp.		x
Wild mustard	Brassica campestris		x
Wild oats***	Avena fatua	x	x
Wild onion	Allium spp.		x
Wild petunia	Petunia parviflora	x	
Wood rush	Luzula subsessilis		x
Wood strawberry	Fragaria californica	x	
Woodland star	Lithophragma affine	x	
Yarrow	Achillea borealis spp. californica	x	x
Yellow mariposa lily	Chalochortus luteus	x	
Yellow star thistle	Centaurea solstitialis		x
Yerba buena	Satureja douglasii	x	

* Partial species list sources: Department of the Army, 1975; California Natural Areas Coordinating Council, 1975.

** Partial species list combining both installations: No separate species list is available for Camp Roberts. Source: Department of the Army, 1976; California Natural Areas Coordinating Council, 1975.

*** Introduced.

APPENDIX B

FAUNA OF THE STUDY AREA

Common Name	Scientific Name	Fort Ord[1]	Fort Hunter Liggett[2]	Camp Roberts[3]
REPTILES AND AMPHIBIANS				
California newt	Taricha torosa torosa	x	x	x
Yellow-eyed salamander	Ensatina eschscholtzi xanthoptica		x	x
Santa Cruz long-toed salamander	Ambystoma macrodactylum var. croceum	x		
California slender salamander	Batrachoseps attenuatus	x	x	x
Arboreal salamander	Aneides lugubris		x	
California tiger salamander	Ambystoma tigrinum	x		x
California tree frog	Hyla cadaverina		x	x
Pacific tree frog	Hyla regilla	x		x
Red-legged frog	Rana aurora	x		x
Foothill yellow-legged frog	Rana boylei	x		x
Bull frog	Rana catesbeiana	x	x	x
California toad*	Bufo boreas halophilus	x	x	x
Western spadefoot*	Scaphiopus hammondi	x		x
Western pond turtle	Clemmys marmorata	x	x	x
Western fence lizard*	Sceloporus occidentalis	x	x	x
California side-blotched lizard*	Uta stansburiana			x
Coast horned lizard	Phrynosoma coronatum	x		x
Western skink	Eumeces skiltonianus	x		x
California whiptail lizard*	Cnemidophorus tigris mundus			x
California alligator lizard*	Gerrhonotus multicarinatus	x		x
California legless lizard*	Anniella pulchra	x		x
Pacific rubber boa*	Charina bottae	x		
California striped racer*	Masticophis lateralis	x	x	x
San Joaquin whipsnake*	Masticophis flagellum ruddocki			x
Western yellow-bellied racer*	Coluber constrictor	x		x
Pacific gopher snake*	Pituophis melanoleucus	x	x	x
Common kingsnake*	Lampropeltis getulus	x	x	x
Coast mountain kingsnake*	Lampropeltis zonata	x		
Coast garter snake*	Thamnophis elegans terrestris			x
Common garter snake*	Thamnophis sirtalis	x	x	x
Two-striped garter snake*	Thamnophis couchi hammondi			x
California night snake*	Hypsiglena torquata			x
Western rattlesnake*	Crotalus viridis	x	x	x
FISHES				
White catfish	Ictalurus catus		x	
Channel catfish	Ictalurus punctatus	x	x	
Brown bullhead	Ictalurus nebulosus	x		
Sacramento sucker	Catostomus occidentalis		x	x
Green sunfish	Lepomis cyanellus		x	x
Bluegill	Lepomis macrochirus	x	x	
Redear sunfish	Lepomis microlophus	x	x	
Smallmouth bass	Micropterus dolomieui		x	x
Largemouth bass	Micropterus salmoides	x	x	x
Rainbow trout	Salmo gairdneri	x	x	x
Brown trout	Salmo trutta			x
Surfperch	Amphistichus spp.	x		
Starry flounder	Platichthys stellatus	x		
Striped bass	Roccus saxatilis	x		
Sacramento squawfish	Ptychocheilus grandis		x	x
California roach	Hesperoleucus symmetricus		x	x
Speckled dace	Rhinichthys osculus		x	x
Lamprey				x

Common Name	Scientific Name	Fort Ord[1]	Fort Hunter Liggett[2]	Camp Roberts[3]
BIRDS				
Common loon	Gavia immer	x	x	
Arctic loon	Gavia arctica	x		
Red-throated loon	Gavia stellata	x		
Horned grebe	Podiceps auritus	x	x	
Western grebe	Aechmophorus occidentalis	x	x	
Eared grebe	Podiceps nigricollis	x	x	
Red-necked grebe	Podiceps grisegena	x		
Pied-billed grebe	Podilymbus podiceps	x	x	
Northern fulmar	Fulmaris glacialis	x		
Sooty shearwater	Puffinis griseus	x		
Brown pelican	Pelecanus occidentalis	x		
Brant's cormorant	Phalacrocorax penicillatus	x		
Pelagic cormorant	Phalacrocorax pelagicus	x		
Great blue heron	Ardea herodias	x	x	x
Green heron	Butorides virescens	x	x	x
Black-crowned night heron	Nycticorax nycticorax	x		
Snowy egret	Leucophoyx thula	x		
Great egret	Casmerodius albus		x	
Whistling swan	Olor columbianus		x	
Canada goose	Branta canadensis		x	
White-fronted goose	Anser albifrons		x	
Lesser snow goose	Chen caerulescens		x	
Mallard	Anas platyrhynchos	x	x	x
Pintail	Anas acuta	x	x	
Green-winged teal	Anas crecca	x	x	x
Cinnamon teal	Anas cyanoptera	x	x	x
American wigeon	Anas americana	x	x	
Northern shoveler	Anas clypeata		x	
Wood duck	Aix sponsa	x	x	x
Canvasback	Aythya valisineria	x	x	
Redhead	Aythya americana		x	
Ring-necked duck	Aythya collaris		x	
Lesser scaup	Aythya affinis	x	x	
Common goldeneye	Bucephala clangula	x	x	
Bufflehead	Bucephala albeola	x	x	
Oldsquaw	Clangula hyemalis	x		
White-winged scoter	Melanitta deglandi	x		
Surf scoter	Melanitta perspicillata	x		
Ruddy duck	Oxyura jamaicensis	x	x	
Common merganser	Mergus merganser	x	x	
Red-breasted merganser	Mergus serrator	x	x	x
Hooded merganser	Lophodytes cucullatus		x	
Turkey vulture*	Cathartes aura	x	x	x
California condor	Gymnogyps californianus		x	
White-tailed kite*	Elanus leucurus	x	x	
Cooper's hawk*	Accipiter cooperii	x	x	x
Sharp-shinned hawk*	Accipiter striatus	x	x	
Goshawk	Accipiter gentilis		x	
Red-shouldered hawk*	Buteo lineatus	x	x	x
Rough-legged hawk*	Buteo lagopus		x	
Swainson's hawk*	Buteo swainsoni		x	
Ferruginous hawk*	Buteo regalis		x	
Red-tailed hawk*	Buteo jamaicensis	x	x	x
Golden eagle*	Aquila chrysaetos	x	x	x
Southern bald eagle	Haliaeetus leucocephalus	x	x	x
Marsh hawk*	Circus cyaneus		x	
Osprey*	Pandion haliaetus		x	x
Merlin*	Falco columbarius		x	
Prairie falcon*	Falco mexicanus		x	
Peregrine falcon*	Falco peregrinus			x
American kestrel*	Falco sparverius	x	x	x
California quail*	Lophortyx californicus	x	x	x
Mountain quail*	Oreortyx pictus		x	
Turkey*	Meleagris gallopavo		x	
American coot	Fulica americana	x	x	x
Virginia rail	Rallus limicola	x		
Black oystercatcher	Haematopus bachmani	x		

Common Name	Scientific Name	Fort Ord[1]	Fort Hunter Liggett[2]	Camp Roberts[3]
Snowy plover	Charadrius alexandrinus	x		
Killdeer	Charadrius vociferus	x	x	x
Surfbird	Aphriza virgata	x		
Black turnstone	Arenaria melanocephala	x		
Common snipe	Capella gallinago	x	x	x
Whimbrel	Numenius phaeopys	x		
Spotted sandpiper	Actitis macularis		x	
Solitary sandpiper	Tringa solitaria		x	
Wandering tattler	Heteroscelus incanus	x		
Willet	Catoptrophorus semipalmatus	x		
Greater yellowlegs	Totanus melanoleucus	x	x	x
Least sandpiper	Calidris minutilla	x	x	
Dunlin	Calidris alpina		x	
Short-billed dowitcher	Limnodromus griseus	x		
Long-billed dowitcher	Limnodromus scolopaceus	x	x	
Western sandpiper	Calidris mauri	x	x	x
Marbled godwit	Limosa fedoa	x		
Sanderling	Calidris alba	x		
American avocet	Recurvirostra americana		x	x
Black-necked stilt	Himantopus mexicanus		x	
Red phalarope	Phalaropus fulicarius	x		
Northern phalarope	Lobipes lobatus	x	x	
Wilson's phalarope	Steganopus tricolor		x	
Glaucous-winged gull	Larus glaucescens	x		
Western gull	Larus occidentalis	x		
Herring gull	Larus argentatus	x		
California gull	Larus californicus	x		
Ring-billed gull	Larus delanarensis	x		
Bonaparte's gull	Larus philadelpha	x		
New gull	Larus canus	x		
Heermann's gull	Larus heermanni	x		
Least tern	Sterna albifrons	x		
Common murre	Uria aalge	x		
Pigeon guillemot	Cepphus columba	x		
Rhinoceros auklet	Cerorhinca monocerata	x		
Band-tailed pigeon*	Columba fasciata	x	x	x
Mourning dove*	Zenaida macroura	x	x	x
Rock dove*(x)	Columba livia	x		
Roadrunner	Geococcyx californianus	x	x	x
Barn owl	Tyto alba	x	x	x
Screech owl	Otus asio	x	x	
Great horned owl	Bubo virginianus	x	x	x
Pygmy owl	Glaucidium gnoma	x	x	
Burrowing owl*	Speotyto cunicularia	x	x	
Spotted owl	Strix occidentalis		x	
Long-eared owl	Asio otus		x	x
Short-eared owl	Asio flammeus		x	
Saw-whet owl	Aegolius acadicus		x	
Poor-will	Phalaenoptilus nuttallii		x	x
Lesser nighthawk	Chordeiles acutipennis		x	
Black swift	Cypseloides niger		x	
Vaux's swift	Chaetura vauxi		x	
White-throated swift	Aeronautes saxatalis	x	x	x
Black-chinned hummingbird	Archilochus alexandri		x	x
Costa's hummingbird	Calypte costae		x	
Anna's hummingbird	Calypte anna	x	x	x
Rufous hummingbird	Selasphorus rufus		x	x
Allen's hummingbird	Selasphorus sasin	x	x	x
Calliope hummingbird	Stellula calliope		x	
Belted kingfisher	Megaceryle alcyon	x	x	x
Common flicker	Colaptes auratus	x	x	x
Acorn woodpecker	Melanerpes formicivorus	x	x	x
Lewis' woodpecker	Asyndesmus lewis		x	
Hairy woodpecker	Dendrocopos villosus	x	x	x
Downy woodpecker	Dendrocopos pubescens	x	x	x
Nuttall's woodpecker	Dendrocopos nuttallii	x	x	x
Red-breasted sapsucker	Sphyrapicus varius		x	
Cassin's kingbird	Tyrannus vociferans		x	
Western kingbird	Tyrannus verticalis		x	x

Common Name	Scientific Name	Fort Ord[1]	Fort Hunter Liggett[2]	Camp Roberts[3]
Ash-throated flycatcher	Myiarchus cinerascens		x	x
Black phoebe	Sayornis nigricans	x	x	x
Say's phoebe	Sayornis saya	x	x	x
Willow flycatcher	Empidonax trailii		x	
Western flycatcher	Empidonax difficilis		x	x
Western wood pewee	Contopus sordidulus		x	
Olive-sided flycatcher	Nuttallornis borealis	x	x	x
Horned lark	Eremophila alpestris	x	x	x
Violet green swallow	Tachycineta thalassina		x	x
Tree swallow	Iridoprocne bicolor	x	x	x
Bank swallow	Riparia riparia		x	
Rough-winged swallow	Stelgidopteryx ruficollis		x	
Barn swallow	Hirundo rustica	x	x	x
Cliff swallow	Petrochelidon pyrrhonota	x	x	
Purple martin	Progne subis		x	
Stellar's jay	Cyanocitta stelleri	x	x	x
Scrub jay*	Aphelocoma coerulescens	x	x	x
Yellow-billed magpie*	Pica nuttalli	x	x	x
Common raven*	Corvus corax		x	x
Common crow*	Corvus brachyrhynchos	x	x	x
Plain titmouse	Parus inornatus	x	x	x
Chestnut-backed	Parus rufescens	x	x	
Chickadee				
Bushtit	Psaltriparus minimus	x	x	x
Dipper	Cinclus mexicanus		x	
White-breasted nuthatch	Sitta carolinensis		x	
Red-breasted nuthatch	Sitta canadensis		x	
Pygmy nuthatch	Sitta pygmaea		x	x
Brown creeper	Certhia familiaris	x	x	
Wrentit	Chamaea fasciata	x	x	
House wren	Troglodytes aedon	x	x	
Winter wren	Troglodytes troglodytes		x	
Bewick's wren	Thryomanes bewickii	x	x	x
Long-billed marsh wren	Telmatodytes palustris	x	x	
Canyon wren	Catherpes mexicanus		x	
Rock wren	Salpinctes obsoletus		x	
Mockingbird	Mimus polyglottos	x	x	
California thrasher	Toxostoma redivivum	x	x	
American robin	Turdus migratorius	x	x	
Varied thrush	Ixoreus naevius		x	
Townsend's solitaire	Myadestes townsendi		x	
Hermit thrush	Catharus guttata	x	x	
Swainson's thrush	Catharus ustulata	x	x	
Western bluebird	Sialia mexicana	x	x	x
Mountain bluebird	Sialia currucoides		x	
Blue-gray gnatcatcher	Polioptila caerulea		x	x
Golden-crowned kinglet	Regulus satrapa		x	
Ruby-crowned kinglet	Regulus calendula	x	x	x
Water pipit	Anthus spinoletta	x	x	x
Cedar waxwing	Bombycilla cedrorum		x	x
Phainopepla	Phainopepla nitens		x	
Loggerhead shrike*	Lanius ludovicianus	x	x	x
Starling* (x)	Sturnus vulgaris	x	x	x
Hutton's vireo	Vireo huttoni	x	x	x
Bell's vireo	Vireo bellii		x	
Solitary vireo	Vireo solitarius		x	
Warbling vireo	Vireo gilvus	x	x	
Orange-crowned warbler	Vermivora celata	x	x	
Nashville warbler	Vermivora ruficapilla		x	
Yellow warbler	Dendroica petechia	x	x	x
Yellow-rumped warbler	Dendroica coronata auduboni	x	x	x
Townsend's warbler	Dendroica townsendi	x	x	x
Black-throated gray warbler	Dendroica virens		x	
Hermit warbler	Dendroica occidentalis		x	
MacGillivray's warbler	Oporornis tolmiei		x	
Common yellowthroat	Geothlypis trichas	x	x	x
Yellow-breasted chat	Icteria virens		x	
Wilson's warbler	Wilsonia pusilla	x	x	
House sparrow* (x)	Passer domesticus	x	x	

Common Name	Scientific Name	Fort Ord[1]	Fort Hunter Liggett[2]	Camp Roberts[3]
Western meadowlark*	Sturnella neglecta	x	x	x
Yellow-headed blackbird	Xanthocephalus xanthocephalus		x	
Red-winged blackbird	Agelaius phoeniceus	x	x	x
Tricolored blackbird	Agelaius tricolor		x	
Brewer's blackbird*	Euphagus cyanocephalus	x	x	x
Brown-headed cowbird*	Molothrus ater	x	x	x
Northern oriole	Icterus galbula bullockii		x	x
Hooded oriole	Icterus cucullatus		x	
Western tanager	Piranga ludoviciana		x	
Black-headed grosbeak	Pheucticus melanocephalus	x	x	
Rose-breasted grosbeak	Pheucticus ludovicianus			x
Evening grosbeak	Hesperiphona vespertina		x	
Lazuli bunting	Passerina amoena		x	
Purple finch*	Carpodacus purpureus	x	x	x
House finch*	Carpodacus mexicanus	x	x	x
Pine siskin	Spinus pinus		x	
American goldfinch*	Spinus tristis	x	x	
Lesser goldfinch*	Spinus psaltria	x	x	x
Lawrence's goldfinch*	Spinus lawrencei		x	
Red crossbill	Loxia curvirostra		x	
Rufous-sided towhee	Pipilo erythrophthalmus	x	x	x
Brown towhee	Pipilo fuscus	x	x	x
Savannah sparrow*	Passerculus sandwichensis	x	x	
Grasshopper sparrow*	Ammodramus savannarum		x	
Vesper sparrow*	Pooecetes gramineus		x	
Lark sparrow*	Chondestes grammacus		x	
Rufous-crowned sparrow	Aimophila ruficeps		x	
Sage sparrow	Amphispiza belli		x	
Dark-eyed junco*	Juncus hyemalis oreganus	x	x	x
Chipping sparrow*	Spizella passerina		x	
Black-chinned sparrow	Spizella atrogularis		x	
White-crowned sparrow*	Zonotrichia leucophrys	x	x	x
Golden-crowned sparrow*	Zonotrichia atricapilla	x	x	x
White-throated sparrow	Zonotrichia albicollis		x	
Fox sparrow	Passerella iliaca	x	x	
Lincoln's sparrow	Melospiza lincolnii	x	x	
Song sparrow	Melospiza melodia	x	x	x
MAMMALS				
Big brown bat	Eptesicus fuscus		x	
Fringed bat	Myotis thysanodes		x	
California bat	Myotis californicus		x	
Long-eared bat	Myotis evotis		x	
Long-legged bat	Myotis volans		x	
Little brown bat	Myotis lucifugus		x	
Small-footed bat	Myotis subulatus		x	
Yuma bat	Myotis yumanensis		x	
Pallid bat	Antrozous pallidus		x	x
Red bat	Lasiurus borealis		x	
Hoary bat	Lasiurus cinereus		x	
Silver-haired bat	Lasionycteris noctivagans		x	
Mexican freetail bat	Tadarida brasiliensis		x	
Western big-eared bat	Plecotus townsendi		x	
California mule deer*	Odocoileus hemionus californicus	x	x	x
Black-tail deer*	Odocoileus hemionus columbianus	x	x	x
Wild boar* (x)	Sus scrofa		x	x
Mountain lion*	Felis concolor	x	x	x
Bobcat*	Lynx rufus	x	x	x
Black bear	Ursus americanus		x	
Gray fox*	Urocyon cinereoargenteus	x	x	x
San Joaquin kit fox*	Vulpes macrotis mutica		x	x
Coyote*	Canis latrans	x	x	x
Raccoon*	Procyon lotor	x	x	x
Ringtailed cat*	Bassariscus astutus	x	x	
Opossum*	Didelphis marsupialis	x	x	x
Badger*	Taxidea taxus	x	x	x
Beaver	Castor canadensis		x	x
Blacktailed jackrabbit*	Lepus californicus	x	x	x
Audubon cottontail*	Sylvilagus audubonii	x	x	x
Brush rabbit	Sylvilagus bachmani	x	x	
Western grey squirrel*	Sciurus griseus		x	x
California ground squirrel	Spermophilus beecheyi	x	x	x
Merriam chipmunk	Eutamias merriami		x	
Spotted skunk*	Spilogale putorius	x	x	x
Striped skunk*	Mephitis mephitis	x	x	x
Long-tailed weasel*	Mustela frenata	x	x	x
Desert woodrat	Neatoma lepida		x	
Dusky-footed woodrat*	Neatoma fuscipes	x	x	x
Pacific kangaroo rat	Dipodomys agilis		x	
Santa Cruz kangaroo rat*	Dipodomys venustus	x		
Norway rat* (x)	Rattus norvegicus		x	
Roof rat* (x)	Rattus rattus		x	
Muskrat	Ondatra zibethicus			x
Valley pocket gopher*	Thomomys bottae	x	x	x
California mole*	Scapanus latimanus	x	x	x
California vole*	Microtus californicus	x	x	x
California pocket mouse*	Perognathus californicus	x	x	x
California mouse*	Peromyscus californicus	x	x	
Brush mouse	Peromyscus boylei		x	x
Deer mouse*	Peromyscus maniculatus		x	x
Pinyon mouse	Peromyscus truei		x	
House mouse* (x)	Mus musculus	x	x	x
Western harvest mouse*	Reithrodontomys megalotis	x	x	x
Trowbridge shrew	Sorex trowbridgei		x	
Ornate shrew*	Sorex ornatus		x	
Shrew*	Sorex sp.	x		
Sea otter	Enhydra lutrus	x		
Stellar sea lion	Eumetopias jubata	x		
California sea lion	Zalophus californianus	x		
Elephant seal	Mirounga angustirostris	x		
Harbor seal	Phoca vitulina	x		
Baird dolphin	Delphinus bairdi	x		
White-sided dolphin	Lagenorhynchus obliquidens	x		
Killer whale	Orcinus orca	x		
Gray whale	Eschrichtius glaucus	x		

(x) Introduced.

* Habitat and/or food association with the Beechey ground squirrel.

[1] Considered a partial species list. Source: Department of the Army, 1975.

[2] Considered a partial species list. Source for reptiles, amphibians, birds and mammals: California Department of Fish and Game, 1976. Source for fishes: Department of the Army, 1973 and Snider, pers. comm.

[3] Considered a partial species list. Source for birds and mammals: Department of the Army, 1976. Source for fishes: California Department of Fish and Game, 1955 and Snider, pers. comm. Reptiles and amphibians of Camp Roberts are based on distribution maps in Stebbins, 1965.

APPENDIX C

MONTEREY COUNTY

DEPARTMENT OF AGRICULTURE

(408) 758-3876 · 120 WILGART WAY · P.O. BOX 1370 · SALINAS, CALIFORNIA 93901

RICHARD W. NUTTER
AGRICULTURAL COMMISSIONER

August 17, 1976

AGRICULTURAL DAMAGE BY GROUND SQUIRRELS TO LANDS ADJACENT TO MILITARY PROPERTIES

The following is the result of a mail survey conducted by this department to determine agricultural damage by ground squirrels to those lands adjacent to Camp Roberts and Fort Hunter Liggett.

The survey is based on the reporting of 40 ranches representing 77,921 acres. Crop values were taken from the Monterey County Annual Crop Reports 1972-75.

CROP	ACREAGE LOSS	CASH VALUE	ACREAGE LOSS BY YEAR
Dry Pasture	3,614	$ 12,649.00	1972 - 929
Irrigated Pasture	324	25,920.00	1973 - 1,289
Cereal Grain	1,300	312,000.00	1974 - 1,561
Row Crop	550	346,500.00	1975 - 2,009
Total Loss	5,788	$ 697,069.00	

REPORTED LOSS FROM COYOTES: $7,150.00

Sheep	1	$ 100.00
Lambs	133	6,650.00
Pigs	1	100.00
Calves	3	300.00

Extensive damage reported to irrigation systems and roadways.

RWN:ms

APPENDIX D

DEPARTMENT OF AGRICULTURE

COUNTY OF SAN LUIS OBISPO • P. O. BOX 637, SAN LUIS OBISPO, CALIFORNIA 93406
County Airport · Edna Road Telephone AC/805 543-1550, Ext. 254

August 9, 1976

SURVEY DATA OF GROUND SQUIRREL DAMAGE TO CROPS ADJACENT TO CAMP ROBERTS

Seven adjacent property owners that farm over 12,000 acres have reported the following dollar losses due to ground squirrels from Camp Roberts destroying their crops. Also shown is their estimate of their extra cost of controlling squirrels due to reinfestation.

	1973	1974	1975	1976	TOTAL
CROPS					
Wheat	$			2,000.00	2,000.00
Barley	3,317.22	4,889.13	5,089.53	5,704.47	19,000.35
Safflower			1,200.00		1,200.00
Pasture	3,095.00	3,225.00	3,384.00	3,665.00	13,369.00
Other	110.00	100.00	215.00	375.00	800.00
Sub-Total	6,522.22	8,214.13	9,888.53	11,744.47	36,369.35
REINFESTATION					
Cost of retreatment	870.50	1,040.92	1,341.66	1,724.80	4,977.88
Total	$7,392.72	9,255.05	11,230.19	13,469.27	41,347.23

APPENDIX E

LAND USE REGULATIONS FOR AREA "B"
CAMP ROBERTS, CA

1. These Land Use Regulations are intended to provide for multiple purpose use of these lands for military purposes, grazing by domestic livestock and, at the same time, protect the ecology and environment of the area to assure continued habitat for indigenous wildlife forms. Adherence to the Land Use Regulations will conserve and enhance the natural environment while permitting beneficial use.

2. Use of the leased premises by the lessee shall be limited to SHEEP GRAZING ONLY.

3. The following definitions shall apply for the purpose of this lease, notwithstanding any other commonly known definitions:

Animal Unit (AU) - Five (5) Ewes with lamb, or Rams or weaned lambs or older sheep.

Animal Unit Month (AUM) - One (1) Animal Unit grazing for an entire month.

4. The availability of adequate forage and the general condition of the range, as DETERMINED BY THE DISTRICT ENGINEER, shall govern the intensity of grazing by the lessee. The protection of the range cover from damage or destruction by overgrazing, fire, erosion or other causes is expressly considered a part of good range management. Accordingly, the lessee shall comply with the following management practices:

a. Grazing capacity - 3500 Animal Unit Months, as defined above, for the period 1 October to 30 September annually. ANY INCREASE IN THE GRAZING CAPACITY MUST HAVE THE PRIOR WRITTEN APPROVAL OF THE DISTRICT ENGINEER. IT IS ALSO EXPRESSLY UNDERSTOOD THAT THE DISTRICT ENGINEER RESERVES THE RIGHT TO (1) LIMIT THE NUMBER OF SHEEP AT THE BEGINNING OF THE GRAZING SEASON, AND (2) REDUCE THE ALLOWABLE AUM's IN A POOR FORAGE YEAR, OR WHENEVER NECESSARY TO PROTECT OR CONSERVE THE RESOURCES. If the lessee grazes more than 3500 AUM'S during the annual period of 1 October to 30 September lessee shall pay for each additional AUM at a rate as determined by dividing the annual rent by 3500 AUM. Conversely, if the lessee is prevented from grazing 3500 during the said annual period as a result of compliance with written instructions from the District Engineer requiring a reduction in allowable AUM'S, the lessee shall be credited for each AUM not grazed at a rate determined by the aforesaid formula.

b. Grazing season - The primary grazing season shall be from 1 January to 1 June. Grazing earlier in the winter period will be permitted only when the District Engineer determines there is adequate new growth of forage.

Permission to graze prior to 1 January must be obtained in writing from the District Engineer. Under normal conditions, no grazing will be allowed between 1 June and 1 September of each year. Any exceptions must be obtained in writing from the District Engineer.

c. Salting stations - Will not be placed adjacent to artificial lakes or potable water points and will be moved as needed to prevent serious trampling of vegetation.

5. The primary use of Camp Roberts' Military Reservation is for military training and related activities; the grazing of sheep on the installation is secondary and subject to these activities. Consequently, the lessee is expected to conduct his grazing operation in a manner which will not interfere with such military use or objectives at any time. Grazing will be closely coordinated with the Post Commander, Camp Roberts, or his authorized representative, so that no interference with military training will occur. Also see Land Use Regulation No. 6. When military circumstances so warrant, the lessee agrees to move his livestock to another area (within the leased premises) within three (3) days after being notified in writing by said Post Commander or his authorized representative. There may be occasional circumstances that will require the livestock be moved to another area within the leased premises on shorter notice. No reduction in rental will be allowed for the movement of livestock required pursuant to this condition and the lessee shall hold the Government harmless for any loss of weight to livestock resulting therefrom.

6. When livestock are grazing on the premises, the lessee, or his representative, will contact the Director of Operations and Training Office, Camp Roberts, on a daily basis, unless otherwise requested by the Post Commander, in order to maintain adequate coordination between military uses and the lessee regarding the grazing operation.

7. Lessee shall bury or otherwise dispose of dead livestock in a manner satisfactory to the Post Commander, or his authorized representative, within twenty-four (24) hours after detection by the lessee or notification by the Government.

8. Lessee shall insure proper cleanup of areas used by his personnel, i.e., disposal of all types of refuse and debris generated at temporary living and work sites.

9. Lessee will insure that all his personnel operating under the terms of this lease are acquainted with and comply with the following:

a. Posted speed limits and pertinent traffic control signs.

b. Posted (restricted) areas.

c. Hunting and fishing regulations.

10. The leased premises will be subject to fishing and hunting by authorized persons during the regular seasons.

11. On or before the 10th day of each month during the grazing period, the lessee shall submit a certificate under the penalty of perjury that lists the number of Animal Unit Months grazed on the area during the previous month. The forms will be provided by the District Engineer. The certificate will be prepared in duplicate and submitted to the following:

District Engineer
US Army Engineer District, Sacramento
ATTN: SPKRE-M
650 Capitol Mall
Sacramento, California 95814

Reserve Components Training Command
California National Guard
ATTN: Facilities Engineer
Camp Roberts, CA 93451

12. The sheep will be in bands of not more than 1,600 head and shall be accompanied by a herder. The sheep will not be bedded down more than three (3) nights in any one area.

13. The Lessee will have joint use of the Nacimiento River for sheep watering purposes. Any matters pertaining to this joint use not settled between Lessees will be arbitrated by the Post Commander whose deicision will be final.

14. Areas fenced for wildlife purposes and reforestation enclosures shall not be grazed.

15. The lessee shall comply with applicable Federal, State, and local animal health laws and regulations of sheep placed on the leased premises, and upon request furnish written evidence to this effect to the District Engineer.

16. Lessee shall sheep graze the cantonment area of the East Garrison as requested and prescribed by the Post Commander for the Purposes of reducing the fire hazard in this area.

17. Lessee at this own cost and expense shall perform the following services of maintenance, repair or protection:

a. Lessee will maintain in a sheep tight condition, all Reservation Boundary Fence, excepting chain link fence, and all other fencing separating his leased premises from adjoining Government or non-Government property. All materials used in maintaining Government-owned fences become the property of the U.S. Government and shall not be removed by the Lessee. A certificate that all fences are sheep tight will be made a part of the monthly report on range usage.

18. Work to be performed by the Lessee for which a credit or refund will be allowed by the Government is shown on the attached Work Schedule. The amount of credit or refund to be allowed by the Government will be the lessee's actual cost of performing the work but not to exceed the amount of the Government estimate shown in the Work Schedule. The District Engineer shall have the right to perform an audit of the lessee's records for the purpose of determining the accuracy and allowability of costs claimed for said work. The lessee shall notify the Facilities Engineer, Camp Roberts, at lease three (3) days prior to commencing the work and immediately upon completion thereof. Work as used herein included all labor, equipment, and materials. The Distirct Engineer reserves the right to modify any of the items of said work as may be in the best interest of the Government. The District Engineer also reserves the right to negotiate with the lessee for accomplishment of additional work items during the term of the lease. In addition to the work shown on the attached Work Schedule, it is specifically understood that the Lessee agrees to perform, in accordance with the provisions of this paragraph, such rodent, Loco Weed, and Russian Thistle control work as may be determined by the District Engineer to be in the best interest of the Government.

19. Effective on or about 1 May of each year certain areas within the leased premises may be Control-burned by the Government. The location and size of actual burn areas may vary according to military requirements. The Government assumes no responsibility for the loss of grazing due to controlled burning on these areas.

LAND USE REGULATIONS
AGRICULTURE AND GRAZING LEASE
HUNTER LIGGETT MILITARY RESERVATION (HLMR)
AREA "B" 86,000 ACRES

1. These Land Use Regulations are intended to: (1) provide for the multiple purpose use of these lands for military purposes, grazing by domestic livestock, public recreation, water conservation and wildlife habitat; (2) protect the ecological balance to insure the continued productivity of the land while permitting economic returns to the lessee.

2. The primary use of the HLMR is for military activities. The grazing operation is one of many secondary uses subject to the military requirements for the area. The lessee shall conduct his operation in a manner which will not interfere with military use.

3. The lessee or his representative, hereinafter referred to as "lessee" shall closely coordinate the agricultural and grazing operations with the Deputy Post Commander, HLMR, or his authorized representative hereinafter referred to as "said commander." In addition, said lessee shall be available to correct emergency situations with regard to the lease. Accordingly, the lessee shall provide said commander with current emergency telephone numbers where the lessee may be contacted during working and non-working hours. When livestock are grazing on the premises, the lessee, or his representative, will contact the Facilities Engineering Office, HLMR, at least once each week in order to maintain adequate coordination between military uses and the lessee's operation.

4. In the event military requirements so demand and upon 48 hours notice from the said commander, the lessee shall gather, move and hold his livestock outside specified areas within the leased premises. If adequate forage does not exist on the remaining areas, livestock shall be removed from the installation. No reduction in rental will be allowed for such movement of livestock. The lessee shall hold the government harmless for any weight loss in livestock or inconvenience incurred pursuant to this condition.

5. It is the expressed intent of the government that the land be utilized in accordance with sound range management practices consistent with concurrent multiple purpose use. The protection of the soil and its vegetative cover from deterioration by erosion, overgrazing, wildfire, noxious weed infestation or other causes is considered part of sound range management. Accordingly, the following practices are established:

a. Types of Use: (1) The grazing use of the leased premises shall be limited to large livestock, i.e. cattle or horses. The grazing of other types of livestock (sheep, goats, pigs, etc.) must have the prior written consent of the District Engineer, Sacramento District, or his authorized representative, hereinafter referred to as "District Engineer." (2) Any other agricultural use of the leased premises such as the cutting of native hay, growing crops, etc. must have the prior written consent of the District Engineer.

b. Grazing Capacity: The maximum grazing capacity of the leased premises shall not exceed 45,000 Animal Unit Months (AUM's) (as defined in paragraph No. 6 below) during each lease year (1 November-31 October). Of said 45,000 AUM's, no more than 5,000 AUM's shall be utilized during the period 1 November-31 December and no more than 6,000 AUM's shall be utilized during the period 1 August-31 October of each lease year.

c. Intensity of Grazing: The availability of forage and the general condition of the range shall govern the intensity of grazing by livestock. It is the expressed concern of the government that the range not be overgrazed and that a layer of living or dry vegetation (mulch) be maintained to protect the soil from erosion and to enhance growing conditions for forage crop seedlings. All grazing shall cease on any part or all of the leased area, when, in the opinion of the District Engineer, the accessible forage has been utilized to a degree where further grazing is not in the best interest of the government. Accordingly, said grazing capacity may be modified by the District Engineer as follows: (1) The District Engineer reserves the right to reduce the number of allowable AUM's in any lease year. Therefore, if the lessee is prevented from utilizing 45,000 AUM's during a lease year as a result of compliance with written instructions from the District Engineer (said instructions requiring a reduction in allable AUM's), the lessee shall be entitled to a rebate in rental. Said rebate shall be determined by dividing the annual rental rate by 45,000 AUM's and then multiplying by the number of AUM's not attained. (2) The District Engineer may allow an increase in the grazing capacity providing adequate forage exists, as determined by the District Engineer, to support additional AUM's (generally this determination will be made by 31 May of each lease year). Permission in writing must be granted by the District Engineer prior to the lessee's exceeding the AUM grazing capacity. The lessee hereby agrees to pay for each additional AUM at the rate defined in paragraph 5c (1) above.

d. Distribution of Livestock: The lessee shall make every effort to obtain optimum distribution of livestock over the leased area to obtain uniform range utilization, to minimize "sacrifice" (overgrazed) areas and to reduce the overall fire hazard. Accordingly, salt blocks and feed supplements shall not be located adjacent to watering areas or improved roads but shall be distributed uniformly throughout the remaining leased area. The lessee shall periodically move salt block and feed supplement sites at the direction of said commander. Any salting stations which may be designated on the ground and marked accordingly by said commander shall be utilized.

6. The lessee shall submit by the 10th day of each month a certificate that lists the number of animal unit months (AUM's) grazed during the previous month. The certificate, to be provided by the District Engineer, specifies the method for computing AUM's. The form shall be made out in triplicate and sent to the following addresses:

District Engineer	Deputy Post Commander	Commander
ATTN: SPKRE-M	ATTN: ATZO-HLMR-FE	US Army Training Center
650 Capitol Mall	Hunter Liggett Mil. Res.	ATTN: AFZW-FE-BG
Sacramento, CA 95814	Jolon, CA 93928	Fort Ord, CA 93941

The following definitions shall apply for the purpose of this report, not withstanding any other commonly known definitions:

Animal Unit = One (1) horse; one (1) cow, heifer, steer or bull; one (1) weaned calf

Animal Unit Month (AUM) = One animal unit grazing for an entire month.

7. The lessee shall comply with all federal, state and local animal health laws and regulations with respect to livestock grazing on the leased premises; and upon request, shall furnish written evidence to that effect to the said commander. In accordance with appropriate Army regulations (AR 40-555) said commander reserves the right to impose quarantine, immunization or other health requirements deemed necessary to prevent or control zoonotic diseases.

8. The government reserves the right to verify the number of animals brought onto the leased premises. Therefore, the lessee shall notify the Facilities Engineering Office, HLMR (Phone No. 408 385-5911 Ext. 2515 or 2514) at least 48 hours in advance of placing new livestock on the leased premises. Copies of all shipping documents and, if required, health certificates shall be furnished by the lessee to said commander. (NOTE: This may include "way bills", owner's written statements, brand inspection reports or shipping permits depending on the type, certification and origin of the livestock.)

9. It is the lessee's responsibility to confine his livestock within the leased premises. It is recognized, however, that the lessee's livestock may occasionally stray onto other leased areas within HLMR and, likewise, that livestock from other HLMR leases may stray onto the leased premises. Therefore, it is encumbant upon the lessee and to other parties leasing or subleasing government land at HLMR to facilitate retrieval of livestock which have strayed from a particular leasehold. Accordingly, the following conditions are set forth:

a. The lessee shall notify the government by contacting the HLMR Facilities Engineering Office, Phone No. 408 385-5911 Ext. 2514 or 2515, at least three days in advance of working (branding, shipping, etc.) livestock on the leased premises. In the absence of an authorized representative at the Facilities Engineering Office, said commander may be contacted at Ext. 2505 (evenings use Ext. 2606). Upon receipt of such notice, the government will make a concerted effort to contact the other lessees at HLMR and notify them to be present, if they desire, to retrieve any of their livestock which may have strayed onto the leased premises.

b. The lessee hereby authorizes said commander to invite other lessees at HLMR, their representatives and employees to be present during the time said work is being performed for the purposes of collecting and removing their stray livestock from the leased premises. In the event a dispute arises concerning ownership or other matters pertaining to the retrieval of livestock, said dispute shall be immediately submitted to said commander for resolution.

c. The lessee shall provide the Facilities Engineering Office with the names and phone numbers of his representatives who are authorized to receive notices concerning the working of livestock by other lessees at HLMR. It is the lessee's responsibility to insure that authorized persons are readily available to receive messages concerning the working of livestock and thus avail themselves of the opportunity to retrieve their stray livestock.

10. The lessee shall immediately dispose of dead livestock in a manner satisfactory to the said commander. The lessee may be required to remove dead animals entirely from the installation as determined by said commander.

11. The entire leased area is subject to hunting (during regular seasons), fishing and other recreational uses by persons authorized by the government.

12. The lessee and all people in his employ shall adhere to installation regulations regarding vehicle travel, security, safety, hunting, fishing and woodcutting.

13. The lessee shall insure proper clean-up of areas used by his personnel and shall dispose of all refuse and debris generated at his temporary work sites to the satisfaction of said commander.

14. The lessee shall honor all wildlife, forestry, weather station, study, bivouac area and other exclosures and shall immediately remove livestock straying therein. The government reserves the right to erect additional exclosures for which no rental adjustment will be made.

15. The lessee at his own cost and expense, shall participate in a noxious weed control program which shall be in accordance with the standards set by the local county agricultural agent. The lessee shall obtain written approval from said commander prior to using any pesticide on the leased premises. All pesticide applications must be supervised by a certified government pest controller. As used herein, the term pesticide includes herbicides, insecticides, fungicides, and rodenticides, but does not include products commonly known as medicines.

16. The lessee, at his own cost and expense, shall repair and maintain in a livestock-tight condition, the fences, cattleguards, gates and other facilities as indicated on said Exhibit "A". All materials used in maintaining government-owned facilities shall be at least the same type and quality as those used in

original construction. All materials used for such repairs shall become the property of the government. The lessee shall repair all said facilities damaged by private vehicles and natural hazards (unless the District Engineer determines the damage from said natural hazards to be excessive, above and beyond normal wear and tear). The government shall repair said facilities damaged by military and firefighting activities. Emergency repairs, as determined by said commander, shall be made within 48 hours after notification by said commander.

17. Work to be performed by the lessee for which a credit or refund will be allowed by the government is shown on the attached Work Schedule (WS). The amount of credit or refund to be allowed by the government shall be negotiated prior to beginning each project. Appropriate Technical Specifications, locations, schedules and the negotiated credit amounts will be made a part of this lease by Supplemental Agreement. The term "work" implies all labor, equipment and materials. The District Engineer reserves the right to modify, add, or delete items of work on the WS as may be in the best interest of the government. The District Engineer will negotiate with the lessee for the accomplishment of additional work or modification of scheduled work. The lessee shall notify and coordinate with said commander prior to beginning work projects.

18. The lessee shall not accept any federal cost sharing payments for soil conservation practices required by the lease that will result in duplicate payment for such practices.

19. The right is reserved for others, as directed by said commander to conduct conservation programs, fire control and prevention (including maintenance of firebreaks), pest and weed control on the leased premises.

20. Water for livestock watering purposes is available from all existing reservoirs, check dams, improved and unimproved springs, and rivers within the leased area. In addition, the lessee may obtain water from the government-owned and operated wells shown on said Exhibit "A".

21. During the period 1 May through 31 October of each lease year, certain areas within the leased premises may be control burned by the government. The location and size of the burn areas may vary according to military requirements. The government shall notify the lessee prior to such control burning to insure the safety of the lessee, his employees, equipment and livestock.

22. The western boundary of the leased premises is established as a "natural line of drift" for cattle. This boundary is not fenced; however, the area westward is steep and brush covered. The lessee will be required to contain his animals within the leased premises. Animals found west of this boundary will be returned to the leased premises by the lessee within 48 hours after notification by said commander.

APPENDIX F

EXAMPLE SPECIMEN LABELS FOR SEVERAL GROUND SQUIRREL RODENTICIDES. THESE LABELS ARE PRESENTLY LEGAL UNDER CALIFORNIA LAW, BUT ARE CURRENTLY BEING UPDATED TO MEET STRICTER STATE AND EPA STANDARDS UNDER CALIFORNIA SECTION 24-C REGISTRATIONS (LEVINGSTON, PERS. COMM.).

SPECIMEN LABEL

SKULL and CROSSBONES

POISON

1080 POISON BAIT - OAT GROATS

SKULL and CROSSBONES

POISON

DANGER: KEEP OUT OF REACH OF CHILDREN

INGREDIENT STATEMENT:

Active Ingredient:	Sodium Fluoroacetate	0.120%
Inert Ingredients:		99.880%
	TOTAL	100.000%

DANGER: Harmful if swallowed. May cause secondary poisoning in other animals. Keep pets and domestic animals away from baited areas. Keep out of reach of irresponsible persons. Do not contaminate feed and foodstuffs. Spilled bait should be cleaned up immediately. Wash hands after using.

FIRST AID TREATMENT: If swallowed, immediately induce vomiting by giving a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Then give two tablespoonfuls of Epsom salt in water. Have victim lie down and keep warm and quiet. Call a physician immediately.

DIRECTIONS FOR USE: Spread bait evenly by hand, machine spreader, or aircraft (consult "Guidelines for Applying Rodent Baits by Aircraft for Control of Ground Squirrels" for further procedures) at the rate of five or six pounds per swath acre through infested area, depending on degree of infestation. Bait should be applied in swaths 30 feet wide with 30 feet between swaths. This poison bait is to be applied only under the supervision of the County Agricultural Commissioner.

SPECIMEN LABEL

AA

SKULL and CROSSBONES POISON

GROUND SQUIRREL - 1080 POISON BAIT

SKULL and CROSSBONES POISON

DANGER: KEEP OUT OF REACH OF CHILDREN

INGREDIENT STATEMENT:

Active Ingredient:	Sodium Fluoroacetate......................	0.078%
Inert Ingredients:	....	99.922%
	TOTAL................	100.000%

DANGER: Harmful if swallowed. May cause secondary poisoning in other animals. Keep pets and domestic animals away from baited areas. Keep out of reach of irresponsible persons. Do not contaminate feed and foodstuffs. Spilled bait should be cleaned up immediately. Wash hands after using.

FIRST AID TREATMENT: If swallowed, immediately induce vomiting by giving a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Then give two tablespoonfuls of Epsom salt in water. Have victim lie down and keep warm and quiet. Call a physician immediately.

DIRECTIONS FOR USE: Evenly scatter a teaspoon quantity of bait (about 80 baits per pound) on bare ground to cover 2 to 3 square feet at side or behind each burrow. Do not over bait, and do not place bait in piles. This poison bait is to be applied only under the supervision of the County Agricultural Commissioner.

SPECIMEN LABEL

AA

ZINC PHOSPHIDE BROADCAST POISON GRAIN BAIT
(For Ground Squirrel, Rat and Meadow Mouse Control)

INGREDIENT STATEMENT:

Active Ingredient: Zinc Phosphide	1.69%
Inert Ingredients:	98.31%
TOTAL	100.00%

FIRST AID TREATMENT: Call a physician immediately. If conscious, induce vomiting by giving a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Give milk or white of egg beaten with water. Keep patient warm and quiet.

INSTRUCTIONS FOR USE: A permit from the County Agricultural Commissioner is required to possess this bait material.

For Ground Squirrel: Spread bait evenly by hand, mechanical spreader or aircraft at the rate of six pounds per swath acre through infested area.

For Meadow Mice: Spread bait evenly by hand, mechanical spreader or aircraft at the rate of 5-10 pounds per acre, depending on the density of the infestation.

For Rats: Spread bait evenly by hand, mechanical spreader or aircraft over infested area at the rate of three to eight pounds per acre, depending on rat density.

Consult agricultural commissioner for specific instructions.

Warning
~~CAUTION:~~ Harmful if swallowed. Avoid breathing dust or fumes. Avoid contact with skin. Wash hands after using. Avoid contamination of feed and foodstuffs. Keep away from children and domestic animals with due regard to wildlife. If applied by hand wear rubber gloves. Clean up spilled bait and dispose by suitable means.

Specimen Label

AA

ZINC PHOSPHIDE SPOT POISON GRAIN BAIT
(For Ground Squirrel, Rat and Meadow Mouse Control)

INGREDIENT STATEMENT:

Active Ingredient: Zinc Phosphide...................... 0.8%
Inert Ingredients: 99.2%
TOTAL............. 100.0%

FIRST AID TREATMENT: Call Physician immediately. If victim is conscious, induce vomiting by giving a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Give victim milk or white of egg beaten with water. Keep patient quiet and warm.

INSTRUCTIONS FOR USE: A permit from the County Agricultural Commissioner is required to possess this bait material.
For Ground Squirrels: Evenly scatter a tablespoon quantity of bait on bare ground at side or behind each active burrow.
For Meadow Mice: Lightly scatter teaspoon quantities of bait in runways near active burrows.
For Rats: Place a teaspoon quantity of bait in each active burrow or scatter small amounts of bait in protected places frequented by rats, but inaccessible to livestock, poultry and other wildlife.

WARNING: Harmful if swallowed. Avoid breathing dust or fumes. Avoid contact with skin. If applied by hand, wear rubber gloves. Do not contaminate feed or foodstuff. Keep out of reach of children, domestic animals and wildlife. Spilled bait should be cleaned up immediately. Wash hands after using.

SPECIMEN LABEL

AA

ANTI-COAGULANT RAT AND SQUIRREL BAIT

INGREDIENT STATEMENT

Active Ingredient: (2-Diphenylacetyl)-1,3-indandione..... .01%
Inert Ingredients:.. 99.99%
TOTAL....100.00%

CAUTION: KEEP OUT OF REACH OF CHILDREN.

FIRST AID TREATMENT: Call a physician. If consious, induce vomiting by giving a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Keep patient quiet.

INSTRUCTIONS FOR USE: Place a cupful of bait in bait box or in shallow container preferably in protected feed stations, bait stations should be located in dry locations frequented by rats. Broadcast bait for squirrels at a handful per hole, wearing protective gloves. Inspect stations daily and add bait as needed, increase the amount when containers are emptied overnight. Continue as long as any bait is taken, which may be from two to four weeks. For roof rats put bait at ground floor and top floor or attic levels. For Norway rats put bait at or near ground level and at burrows and harborages.
Note: A single feeding on this bait will not control rats and squirrels. Bait must be eaten at several feedings on five or more successive days, with no periods longer than 48 hours between feedings.

Caution
~~WARNING~~: Keep away from humans, domestic animals and pets. If swallowed, this material may reduce the clotting ability of the blood and cause bleeding. In such cases, intravenous and oral administration of Vitamin K combined with blood transfusions are indicated as in the case of hemorrhage caused by overdoses of bis-hydroxycoumarin. Spilled bait should be cleaned up immediately. Wash hands after using.

CAUTION

CAUTION

CARBON BISULPHIDE FUMIGANT

Active Ingredients: Carbon Bisulphide - 100%

First Aid Treatment: Move patient to fresh air if atmosphere is contaminated. Apply artificial respiration if not breathing.

If Swallowed: if conscious induce vomiting by giving a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Call a physician immediately.

Instructions for Use: Consult Agricultural Commissioner for suggestions as to proper use.

WARNING: Flammable. Vapor is explosive. Keep away from fire, sparks, lighted cigarettes, etc. Do not leave in direct sunlight. Store in cool, dry place. Avoid prolonged breathing of vapor. Use with adequate ventilation. Keep out of reach of children or irresponsible persons.

Net Contents ______________ Gals.

Skull and
Cross Bones
POISON

METHYL BROMIDE FUMIGANT

Skull and
Cross Bones
POISON

For Ground Squirrels

Active Ingredients: 100% P-O-T-A-S-H

Methyl Bromide: 100% DO NOT INHALE VAPORS

WARNING: POISONOUS LIQUID AND VAPOR! Contact with liquid may produce burns. Do not breathe vapor. Do not get in eyes, on skin, or on clothing. In case of contact, immediately remove all contaminated clothing, including shoes. Wash skin thoroughly with soap and water and flush eyes with water for at least 15 minutes. Get medical attention.

DIRECTIONS: Use one 20cc ampoule per squirrel burrow. Break each ampoule, while enclosed in cloth bag, at least one foot below the soil surface using a special applicator available from the Agricultural Commissioners Office. Immediately fill or cover each burrow with soil and pack.

DANGER: Keep out of the reach of children.

CAUTION: Do not drop or throw. Store in a cool, well ventilated place. Use only in well ventilated building or in open. Do not remove ampoule (enclosed in white cloth bag) from the cloth bag.

ANTIDOTE: Remove victim to fresh air immediately. Keep victim lying down and warm. Give artificial respiration if breathing has stopped. Call a physician immediately.

Net Contents: Each ampoule 20cc

State Registration No.: ____________________

APPENDIX G

SELECTED GUIDELINES AND CONSTRAINTS APPLICABLE TO THE USE OF TOXICANTS FOR GROUND SQUIRREL CONTROL IN CALIFORNIA

Extract A. California Administrative Code - Regulations Concerning Economic Poisons (Pesticides). Title 3 - Agriculture; Chapter 4 - Plant Industry; Subchapter 1 - Chemistry; Group 2 - Economic Poisons;

Article 15 - Toxicity Definition and Caution Statements

2425. Warning or Caution Statement. Warning or caution statements, which are necessary, and if complied with, adequate to prevent injury to living man and useful vertebrate animals, useful vegetation, and useful invertebrate animals, must appear on the label in a place sufficiently prominent to warn the user, and must state clearly and in nontechnical language the particular hazard involved in the use of the economic poison, e.g. ingestion, skin absorption, inhalation, flammability or explosion, and the precautions to be taken to avoid accident, injury, or damage.

(a) The label of every economic poison shall bear warnings or cautions which are necessary for the protection of the public, including the statement, "Keep out of reach of children", and a signal word such as "Danger", "Warning", or "Caution" as the Director may prescribe, on the front panel or that part of the label displayed under customary conditions of purchase: Provided however, the Director may permit reasonable variations in the placement of that part of the required warnings and cautions other than the statement "Keep out of reach of children", and the required signal word, if in his opinion such variations would not be injurious to the public. If an economic poison is marketed in channels of trade where the likelihood of contact with children is extremely remote, or if the nature of the product is such that it is likely to be used on infants or small children without causing injury under any reasonably foreseeable conditions, the Director may waive the requirement of the statement "Keep out of reach of children" if in his opinion such a statement is not necessary to prevent injury to the public. The Director may permit a statement such as "Keep away from infants and small children" in lieu of the statement "Keep out of reach of children" if he determined that such a variation would not be injurious to the public.

(b) The label of every economic poison which is highly toxic to man as described in Section 2424 shall bear the word "Danger" along with the word "Poison" in red on contrasting background in immediate proximity to the skull and crossbones, and an antidote statement including directions to call a physician immediately on the front panel or that part of the label displayed under customary conditions of purchase: Provided, however, the Director may permit reasonable variations in the placement of the antidote statement if some reference such as "See antidote statement on pack panel" appears on the front panel near the word "Poison" and the skull and crossbones.

Article 21 - Restricted Materials

2460. Restricted Materials. The director designates and establishes as necessary to carry out the provisions of Division 7 of the Food and Agricultural Code the pesticides stated in this section as restricted materials.

(a) Certain pesticides containing arsenic.

(1) Sodium arsenite, including any preparation of arsenic trioxide or arsenous acid with sodium hydroxide or sodium carbonate which contains as an active ingredient arsenic all in soluble form.

(2) Other pesticides containing inorganic arsenic.

(b) Pesticides containing cadmium.

(c) Pesticides containing mercury.

(d) Certain carbamate compounds.

(1) Aldicarb (Temik)
(2) Carbaryl (Sevin)
(3) Carbofuran (Furadan) (Except granular formulations containing not more than 5% carbofuran)
(4) Methomyl (Lannate) (Nudrin)

(e) Certain fumigants.

(1) Chloropicrin
(2) Methyl bromide
(3) Aluminum phosphide (Phostoxin)
(4) Carbon bisulfide
(5) Calcium cyanide

(f) Seeds treated with mercury compounds.

(g) Conifer seeds treated with endrin.

(h) Certain avicides

(1) 4-aminopyridine (Avitrol)
(2) 3-chloro-p-toluidine hydrochloride (Starlicide)
(3) Strychnine

(i) Certain rodenticides

(1) Sodium flouroacetate (Compound 1080)
(2) Strychnine
(3) Zinc phosphide

(j) Certain organic phosphorus pesticides.

(1) Azinphosmethyl (Guthion)
(2) Carbophenothion (Trithion)
(3) Dimethyl phosphate of 3-Hydroxy N,N-dimethyl-ciscrotonamide (Bidrin)
(4) Dimethyl phosphate of 3-Hydroxy-N-methyl-ciscrotonamide (Azodrin)
(5) O,S-dimethyl phosphoramidothioate (Monitor)
(6) *O,O Dimethyl phosphorodithioate, S-ester with 4-(mercapto*-methyl)-2-methoxy-Δ^2 -1,3,4-thiadiazolin-5-one (Supracide)
(7) Demeton (Systox)
(8) Disulfoton (Di-Syston)
(9) EPN
(10) Ethion
(11) Ethyl 3-Methyl-4-(Methylthio) Phenyl (1-Methyl Ethyl) Phosphoramidate (Nemacur)
(12) Methyl parathion
(13) Mevinphos (Phosdrin)
(14) Parathion
(15) Phorate (Thimet)
(16) Phosphamidon
(17) Schradan (OMPA)
(18) Sulfotepp
(19) TEPP
(20) Dialifor (Torak)
(21) O,O-Diethyl O-±4-(Methylsulfinyl) Phenyll Phosphorothioate (Dasanit)
(22) O-Ethyl S,S-Dipropyl Phosphorodithioate (Mocap)

(k) Certain chlorinated organic *pesticides*.

(1) Aldrin
(2) Benzene Hexachloride (BHC)
(3) Chlordane
(4) DDD (TDE)
(5) DDT
(6) *Dieldrin*
(7) Endosulfan (Thiodan)
(8) Endrin
(9) Heptachlor
(10) Lindane
(11) Toxaphene

(l) All other pesticides registered for use in the form of a dust except those products containing only exempt materials specified in Section 2466.

(m) Certain other pesticides.

(1) Paraquat
(2) Sodium cyanide

Amends Section 2463 to read:

2463. Permits.

(a) Restricted materials specified in Section 2460 shall be possessed or used only under permit of the agricultural commissioner or under *his direct supervision* in any county in which there is a commissioner, or under permit of the director in any county in which there is no commissioner, except as follows:

(1) No permit shall be required for possession or use of the restricted materials specified below, including dust formulations thereof, when possessed and used *only for the following nonagricultural purposes* in accordance with the registered label: home use, structural pest control, industrial use, institutional use, and uses by public agencies which have entered into and operate under a cooperative agreement with the Department of Health pursuant to Section 2426 of the Health and Safety Code.

(A) Pesticides containing arsenic other than sodium arsenite as specified in Section 2460 (a) (1).
(B) Pesticides containing cadmium
(C) Pesticides containing mercury
(D) Carbaryl (Sevin)
(E) Chloropicrin
(F) Methyl bromide
(G) Disulfoton (Di-Syston)
(H) Aldrin
(I) Benzene hexachloride (BHC)
(J) Chlordane
(K) Dieldrin
(L) Endosulfan (Thiodan)
(M) *Heptachlor*
(N) Lindane
(O) Strychnine (rodenticide uses only)
(P) Toxaphene
(Q) Zinc Phosphide
(R) Pesticides included in Section 2460 (1)

(2) *No permit shall be required* to possess or use pesticides containing sodium arsenite as specified in Section 2460 (a)(1) when sold as diluted ready-to-use syrups or dry baits registered and labeled for use as poison baits for the control of insects and other arthropods.

(3) No permit shall be required to possess or use pesticides, included in Section 2460 (1) which are registered for use in the form of a dust and packaged in containers holding 25 pounds or less, or for the use of such pesticides packaged in containers holding more than 25 pounds registered for and used in enclosed areas such as greenhouses.

(4) No permit shall be required to possess or use any restricted material specified in Section 2460 when possessed and used only on livestock or poultry in accordance with the registered labeling.

(5) No permit shall be required to possess or use chloropicrin or methyl bromide when packaged in containers holding one and one half pound or less.

(6) Permits to possess restricted materials shall not be required of economic poison registrants or pesticide dealers when operating under their licenses, or by commercial carriers to transport such materials.

(7) No permit shall be required to possess or use paraquat when possessed and used only for home use in accordance with the registered labeling.

(8) A permit to possess or use O-Ethyl S,S-Dipropyl Phosphorodithioate (Mocap) shall be required only for turf use.

(b) The person in charge of the property to be treated or the pest control operator or both may apply for a permit, but the permit shall not be valid for possession or use by any operator or person not named in the permit.

(c) A permit to use restricted materials shall have an expiration date no later than the calendar year for which issued and shall be valid for the period specified unless sooner revoked or suspended. A copy of each permit shall be retained by the issuing officer.

(d) The person named in a restricted materials permit is authorized to possess materials for which the permit was valid after such permit expires, provided it is stored in accordance with Section 3136.

2463.1 Chloropicrin and Methyl Bromide. (in part)

(a) Field Fumigation.

(1) Except as provided in paragraph (3), chloropicrin or methyl bromide, singly or in combination, for field fumigation of soil by injection, shall be applied at a minimum depth of six inches, unless otherwise specified by the registered label for the intended use, and covered with a gas confining tarp of a thickness approved by the commissioner or director.

Article 22 - Sale, Use and Possession of Sodium Monofluoroacetate

2470. Definitions. As used in this article, unless a different meaning is apparent from the context:

(a) Terms defined in the Food and Agricultural Code have the meanings therein set forth.

(b) "Poison bait" means any mixture or preparation of sodium fluoroacetate, also known as Compound 1080, used with any diluent, substance, or device intended to attract or lure rodents, predatory animals, or other pests.

(c) "Public agency" means federal, state, county or municipal officers or employees, in their official capacities, or persons under the immediate supervision of such officers or employees.

(d) "Structure" means any building, dock, ship or conveyance.

2471. Sale, Possession, and Use in General.

(a) Sales. Each sale of sodium fluoroacetate or any preparation thereof shall be reported to the Director within thirty days from the date of sale.

(b) Records. A written record of all sodium fluoroacetate received and of its use shall be made and kept at least two years after use of the last quantity of each lot received.

(c) Possession. Sodium fluoroacetate or poison bait exposed for pest control or other purposes is deemed to be in the possession of the person by whom it was exposed, unless removed by an unauthorized person.

(d) Storage. All stocks of sodium fluoroacetate and poison bait and all equipment, containers, and utensils which have been used in their preparation or handling, shall be stored in an adequately locked space at all times when not in use. Such space shall be entirely separate from any space, including refrigerated space, where food or drink for humans or animals is kept or stored. All keys to such space shall be kept in the custody of responsible persons.

(e) Containers. No sodium fluoroacetate or poison bait shall be kept or placed in drinking cups, pop bottles or other containers of a type commonly used for food or drink. Sodium fluoroacetate poisoned water shall be stored and transported only in durable, shatter-resistant receptacles.

(f) Labels. All containers, bait boxes or receptacles in which poison bait is kept, transported or exposed shall bear on the outside a conspicuous poison label which shall conform to the label required by Section 20757 of the Health and Safety Code on packages of sodium fluoroacetate sold within the State.

(g) Handling.

(1) All persons who may be required to handle sodium fluoroacetate in any form, whether or not subject to safety orders issued by the Division of Industrial Safety, shall be informed of the hazards, standards of custom and usage, and precautions recommended by the manufacturer, and shall be provided with adequate protective clothing and devices (including respiratory equipment and gloves) as specified in such recommendations.

(2) All weighing, measuring and packaging of sodium fluoroacetate in dry powdered form shall be done in a location or room that has a minimum of cross currents so as to curtail the dissemination of the dry powder into the workroom atmosphere.

(3) Sodium fluoroacetate poisoned water shall be dispensed by syringe, gravity-feed tubing or suitable pouring device, to prevent spillage.

(h) Waste Disposal.

(1) Unused sodium fluoroacetate poisoned water and rinse water contaminated with sodium fluoroacetate shall be flushed to the sewers or excessively diluted (at least 10 to 1) and allowed to soak into barren, porous soil where there is no danger of contaminating water supplies.

(2) No sodium fluoroacetate or substance contaminated therewith shall be poured on vegetation or disposed of in any manner which might endanger domestic animals or beneficial wildlife.

(3) Unused poison baits, and used poison containers other than impervious containers which can be washed free from contamination, and recovered carcasses of poisoned animals shall be destroyed by complete burning or by burying under not less than two feet of soil.

2472. Use for Pest Control Purposes.

(a) Baits. Except as herein specified, sodium fluoroacetate shall not be mixed with or added to any substance or preparation which is or may be taken as food or drink by humans or animals.

(1) For control of house rats and mice, sodium fluoroacetate discolored with nigrosine black dye may be mixed with or added to water, at the rate of not more than one-half ounce of sodium fluoroacetate to one gallon of water; or to cereal grains in dry, uncooked form, at the rate of not more than one ounce of sodium fluoroacetate to 28 pounds of grain. Such cereal grains shall be adequately discolored and may be of one or more varieties, whole, rolled or ground to the consistency of fine meal, but not flour.

(2) For control of pests other than house rats and mice, sodium fluoroacetate with suitable warning discoloration may be added to or mixed with water, grain or other baits.

(b) Bait Boxes and Containers.

(1) Bait boxes may be made of wood, metal or equivalent material, but shall be of rigid construction with unobstructed means of ingress and egress and adequate baffles to maintain the bait within the box.

(2) Openings to bait boxes used for baiting house rats and mice shall not exceed two and one-half inches in any dimension, and shall be not less than one-half inch above the floor of the box.

(3) Bait boxes for outdoor placement shall be constructed and placed in such manner as to protect the bait from rain or flooding.

(4) Each bait box when in use shall be securely fastened.

(5) Containers for exposed sodium fluoroacetate poisoned water shall be constructed of noncorrodible, shatter-resistant material which is moisture-proof for a period to exceed by one week the placement period. Such containers shall not be reused unless cleaned.

(6) Containers for exposed poison bait shall be stable enough to resist tipping or movement by rodents. Containers, other than bait boxes, shall have a flat base or bottom, the diameter of which is not less than three times the height of the container.

(c) Prohibited Use. Nothing in these regulations shall be construed to permit the use of tracking powder containing sodium fluoroacetate in any form, with or without bait.

(d) Indoor Placement. Poison bait shall not be placed in dwellings or dwelling quarters, except by public agencies or licensed structural pest control operators working under direction and supervision of public agencies. Poison bait may be placed in other structures under the following conditions only:

(1) No open container shall be filled to more than one-half its capacity.

(2) No poison bait or container thereof shall be placed on or near food or feed, or containers of food or feed, or spilled food or feed, or in any place where food or feed contamination is likely to occur.

(3) No poison bait or container thereof shall be exposed above the level of the floor of the room or enclosure in which it is placed.

(4) Except for exposure during a period when the structure or room remains closed and locked, all poison bait shall be protected by bait boxes.

(5) Immediately following the period of exposure of any poison bait in or under any structure, all unused poison bait, used poison containers, and recoverable carcasses of poisoned animals shall be picked up. Baits and containers shall be picked up, if possible, by the same person who placed the baits.

(6) A detailed record, diagram or chart shall be made showing the location of all poison bait placements in or under structures, the time of day and date the placements are made, the amount and concentration of the bait, the type of room or area treated and the number of individual placements therein, the name of each person engaged in placing the baits, the number of baits or containers recovered, and an accounting of those not recovered. Such records shall be open at all reasonable times for inspection on request of the Director or agricultural commissioner.

(e) Outdoor Placement. Poison bait placed outside of structures for control of house rats and mice shall be protected by bait boxes, except in garbage or refuse dumps or in locations which are adequately patrolled or otherwise closed to access by unauthorized persons.

Extract B - California Food and Agriculture Code; Division 6 - Pest Control Operators

Chapter 2. General Provisions

11501. The purposes of this division and Chapter 1 (commencing with Section 12501), Chapter 2 (commencing with Section 12751), Chapter 3 (commencing with Section 14001), and Chapter 3.5 (commencing with Section 14101) of Division 7 are as follows:

(a) To provide for the proper, safe, and efficient use of pesticides essential for production of food and fiber and for protection of the public health and safety.

(b) To protect the environment from environmentally harmful pesticides by prohibiting, regulating, or controlling uses of such pesticides.

(c) To assure the agricultural and pest control workers of safe working conditions where pesticides are present.

(d) To permit agricultural pest control by competent and responsible licensees and permittees under strict control of the director and commissioners.

(e) To assure the users that economic poisons are properly labeled and are appropriate for the use designated by the label.

(f) To encourage the development and implementation of pest management systems, stressing application of biological and cultural pest control techniques with selective pesticides when necessary to achieve acceptable levels of control with the least possible harm to nontarget organisms and the environment.

Chapter 5. Aircraft Operation Regulation

Article 1. Generally

11901. It is unlawful for any person to operate any aircraft in the business of pest control unless the pilot operating the aircraft holds one of the following:

(a) A valid certificate of qualification issued by the director.

(b) A valid apprentice certificate issued by the director.

Article 10. Recommendations and Usage

12971. Except as provided in Sections 12974 and 12975, before any pesticide application is made, the applicator shall be in possession of a written recommendation showing the following:

(a) The name and dosage rate of the pesticide or pesticides and other materials to be used.

(b) The pest or pests to be controlled.

(c) The owner or operator, location of and approximate acreage to be treated.

(d) The crops or property to be treated.

(e) The signature and address of the person making the recommendation and name of the business or company which he represents.

(f) The suggested schedule or time, if any, for the pesticide application.

Article 10.5. Pesticides and Worker Safety

12980. The Legislature hereby finds and declares that it is necessary and desirable to provide for the safe use of pesticides and for safe working conditions for farmworkers, pest control applicators, and other persons handling, storing, or applying pesticides, or working in and about pesticide-treated areas.

The Legislature further finds and declares that the development of regulations relating to pesticides and worker safety should be the joint and mutual responsibility of the Department of Food and Agriculture and the Department of Public Health, until the operative date of Governor's Reorganization Plan Number 1 of 1970, and on and after such date, should be the joint and mutual responsibility of the Department of Food and Agriculture and the Department of Health.

The Legislature further finds and declares that in carrying out the provisions of this article, the University of California, the Department of Industrial Relations, and any other similar institution or agency should be consulted.

12981. The director shall adopt regulations to carry out the provisions of this article effective as soon as practicable, however, no later than the first calendar day of the 1974 Regular Session of the Legislature. Such regulations shall include, but are not limited to, all of the following subjects.

(a) Time limits for worker entry into areas treated with pesticides as determined by the director to be hazardous to worker safety.

(b) Handling of pesticides.

(c) Handwashing facilities.

(d) Farm storage and commercial warehousing of pesticides.

(e) Protective devices, including, but not limited to, respirators and eyeglasses.

(f) Posting, in English and Spanish, of fields, areas, adjacent areas or fields, or storage areas.

The State Department of Public Health, until the operative date of Governor's Reorganization Plan Number 1 of 1970, and on and after such date, the Department of Health, shall participate in the development of any regulations adopted pursuant to this article. Such regulations that relate to health effects shall be based upon the recommendations of the Department of Public Health, until the operative date of Governor's Reorganization Plan Number 1 of 1970, and on and after such date, the Department of Health. The original written recommendations of the State Department of Public Health, any subsequent revisions of those recommendations, and the supporting evidence and data upon which the recommendations were based shall be made available upon request to any person.

12982. The director and the commissioner of each county under the direction and supervision of the director, shall enforce the provisions of this article and the regulations adopted pursuant to it. The local health officer may assist the director and the commissioner in the enforcement of the provisions of this article and any regulations adopted pursuant to it. The local health officer shall investigate any condition where a health hazard from pesticide use exists, and shall take necessary action, in cooperation with the commissioner, to abate any such condition. The local health officer may call upon the State Department of Public Health, until the operative date of Governor's Reorganization Plan Number 1 of 1970, and on and after such date the Department of Health, for assistance pursuant to the provisions of Section 2951 of the Health and Safety Code.

CHAPTER 3. RESTRICTED MATERIALS

Article 1. Generally

14001. The director shall control and otherwise regulate the use of restricted materials found to meet the criteria of Section 14004.5.

14002. This chapter applies to all agencies of the United States and the State of California and its subdivisions or to their officers, agents, or employees, except when acting within the scope of their authority and while engaged in conducting or supervising research on any restricted material. Nothing in this Section affects the liability of a public entity under Section 862 of the Government Code.

14003. This article does not relieve any person from liability for any damage to the person or property of another person which is caused by the use of any restricted material.

14004. The director, and the commissioner of each county under the direction and supervision of the director, shall enforce this chapter and the regulations issued pursuant to it.

14004.5. The director, after investigation and hearing, shall designate and establish as necessary to carry out the purposes of this division, a list of restricted materials based upon, but not limited to, any of the following criteria:

(a) Danger of impairment of public health.
(b) Hazards to applicators and farmworkers.
(c) Hazards to domestic animals, including honeybees, or to crops from direct application or drift.
(d) Hazard to the environment from drift onto streams, lakes, and wildlife sanctuaries.
(e) Hazards related to persistent residues in the soil resulting ultimately in contamination of the air, waterways, estuaries or lakes, with consequent damage to fish, wild birds, and other wildlife.
(f) Hazards to subsequent crops through persistent soil residues.

14005. The director, after investigation and hearing, shall adopt regulations which govern the application in pest control or other agricultural operations of any restricted material which he finds and determines is injurious to the environment, or to any person, animal or crop.

14006. The regulations shall prescribe the time when, and the conditions under which, a restricted material may be used or possessed in different areas of the State, and may prohibit its use or possession in such areas. Such usage shall be limited to those situations in which it is reasonably certain that no injury will result, or no nonrestricted material or procedure is equally effective and practical. They may provide that a restricted material shall be used only under permit of the commissioner or under the direct supervision of the commissioner, subject to any of the following limitations:

(a) In certain areas.
(b) Under certain conditions relating to safety.
(c) When used in excess of certain quantities or concentrations.
(d) When used in certain mixtures.
(e) In compliance with the industrial safety orders of the Department of Industrial Relations and any order of the director or commissioner.
(f) On agreement by the owner or person in possession of the property to be treated to comply with certain conditions.
(g) Any other limitation the director determines to be necessary to effectuate the purposes of this chapter.

14006.5. Except as provided in Section 14006.6, no person shall use any pesticide for any agricultural use except under a written permit of the commissioner. No permit shall be issued for any restricted material for use in any manner other than pursuant to its registration without the approval of the director. In addition, no permit shall be granted if the commissioner determines that the provisions of subdivision (a), (b), or (c) of Section 12825 would be applicable to the proposed use.

Before issuing a permit for any pesticide, the commissioner shall consider local conditions including, but not limited to, the following:

(a) Use in vicinity of schools, dwellings, hospitals, recreational areas, and livestock enclosures.
(b) Problems related to heterogeneous planting of crops.
(c) Applications of materials known to create severe resurgence or secondary pest problems without compensating control of pest species.
(d) Meteorological conditions for use.
(e) Timing of applications in relation to bee activity.
(f) Provision for proper storage of pesticides and disposal of containers.

Each permit issued for any pesticide shall include conditions for use in writing.

14006.6. A permit shall not be required for the agricultural use of "exempt materials" determined in accordance with Section 14006.7, or for the agricultural use of any other pesticide not designated as a restricted material which the commissioner determines may be used under local conditions without undue hazard.

Permits for the use of pesticides shall not be required of persons found to be qualified by the director who are engaged in experimentation or research on the use of pesticides, where no charge is made to the grower.

14006.7. The director, after investigation and hearing, shall designate by regulation a list of "exempt materials" for which the director finds additional restrictions, other than registration and labeling requirements are not necessary to carry out the purposes of this chapter. Such exempt materials may be used without a permit provided that such use shall conform with the registered label or printed instructions.

Article 3. Compound 1080

14061. As used in this article, "Compound 1080" means sodium fluoroacetate or any preparation of sodium fluoroacetate.

14062. Except as otherwise provided in this article, it is unlawful for any person to sell, use, or possess any Compound 1080.

14063. Subject to regulations of the director, any of the following persons may sell, use, or possess Compound 1080 for the purposes or uses which are specified:

(a) Any federal, State, county, or municipal officer or employee, in his official capacity, or any person under the immediate supervision of such officer or employee, may possess Compound 1080 for use for pest control purposes.
(b) Any research or chemical laboratory may possess Compound 1080 for use for the purposes of such laboratory.

(c) Any person duly licensed as a structural pest control operator under Chapter 14 (commencing with Section 8500) Divison 3 of the Business and Professions Code, may possess Compound 1080 for use in his business.

(d) Any wholesaler or jobber of any economic poison may sell Compound 1080 to any person included within the above classifications, or for export.

Extract C - California Department of Food and Agriculture Vertebrate Pest Control Handbook (1975)

GUIDELINES FOR BAITING FIELD RODENTS

Pre-Treatment

1. Annual rodent control plans shall be reviewed by the California Department of Fish and Game regarding hazards to rare and endangered species as specified in the "Joint Policy Statement of the California Department of Food and Agriculture, California Department of Fish and Game and the California Agricultural Commissioners Association Regarding Rare and Endangered Species."
2. Actual damage or threat of damage must be sufficient to warrant application of rodent baits. As a safeguard to humans and domestic animals, alternative methods such as fumigants or anticoagulant baits in bait boxes should be considered in preference to broadcasting acute toxic baits around inhabited buildings or suburban areas and domestic animals.
3. Baiting shall not be done unless tests indicate satisfactory bait acceptance occurs in areas to be treated.
4. Bait should be chosen on the basis of selectivity as well as acceptance value.
5. When county agricultural commissioners anticipate control programs involving other than established practices the California Department of Food and Agriculture, Control and Eradication, should be advised.

Treatment

1. The county agricultural commissioner or his staff should be aware of the conditions at the site of application and in a position to direct and control the manner in which the application is made.
2. **Toxic baits used in control operations shall be artificially colored or dyed. The departmental suggestions contained in the Vertebrate Pest Handbook should be used.**
3. Quantities of toxic bait exposed shall be regulated so that residual bait will not present a hazard to nontarget species.
4. Property owners or tenants shall be advised to dispose of rodent carcasses on the ground surface immediately adjacent to inhabited areas. A shovel or pitch fork should be used to minimize possible contact with ectoparasites.
5. There are no specific statutory provisions requiring the posting of warning signs for rodent control. However, when premises are posted in accordance with county policy, they are to be posted as prescribed by the Penal Code, Section 596 - ("... signs located at intervals of distance not greater than one-third of a mile apart and in any case not less than three such signs having words with letters at least one inch high reading 'WARNING - POISON BAIT PLACED OUT ON THESE PREMISES,'...")
6. All accidentally spilled grain bait *shall* be cleaned up immediately.
7. Discarded or used containers shall be disposed of in accordance with California laws and regulations pertaining to disposal of pesticide containers.

Post-Treatment

An annual written evaluation should be made of representative areas describing the degree of control and any observed effects on nontarget wildlife.

SAFETY PRECAUTIONS

The safe handling and use of rodenticides is a responsibility of the agricultural commissioners.

1. Commissioners shall inform employees involved in field rodent control as to the provisions of Regulations Concerning Sale, Use and Possession of Sodium Fluoroacetate (Compound 1080).
2. All bags, sacks, or other containers should have the word "POISON" stenciled or printed directly on package. This is in addition to the normal labeling requirements.
3. Toxic baits and concentrates shall be stored in an adequately locked space at all times when not in use. Such space shall be entirely separate from where food or drink for humans or domestic animals is kept or stored.
4. All persons handling toxic baits or concentrates should be advised as to:
   a. The characteristics of these materials.
   b. The necessity of using adequate protective clothing and devices such as gloves and/or bait spoons for dispensing baits.
   c. The necessity for keeping all skin abrasions and cuts adequately protected.
   d. The possibility of inadvertent poisoning of wildlife and domestic animals by improper bait exposure.
   e. The symptoms of poisoning in man and recommended first aid if such symptoms occur.
5. To prevent the accidental spillage of toxic grain, containers (including sacks, shoulder bags and saddle bags) should be so designed and in such repair that leakage or spillage does not occur. Shoulder bags should be equipped with a zipper or other device for closing. Equip saddle bags with either a zipper or drawstring to facilitate quick closing.
6. Toxic bait accidentally spilled should be immediately and thoroughly cleaned up.
7. Do not leave containers or prepared bait unattended, or where it can be obtained by children, irresponsible persons or animals.
8. Unused bait should be returned to the local agricultural commissioner or disposed of in a Class I dump.
9. Burn empty bait containers (check local regulations).
10. Wash hands with soap and water after handling poison baits and before eating or smoking.

GUIDELINES FOR APPLYING RODENT BAITS BY AIRCRAFT FOR CONTROL OF GROUND SQUIRRELS

Pre-Treatment

1. Actual damage or threat of damage must be sufficient to warrant aerial application of rodent baits. Alternative methods shall always be considered.
2. No baiting shall be implemented unless tests indicate satisfactory bait acceptance occurs in representative areas.
3. The area to be treated shall be clearly defined on topographic maps or aerial photographs for use by the pilots.
4. The pilot shall be thoroughly familiar with the property(ies) to be treated.
5. Property lines and boundaries shall be clearly visible from the air.
6. The aircraft shall be calibrated with nontoxic baits under the supervision of the agricultural commissioner or his staff.
7. A written, general evaluation should be made of several representative areas describing damage or threat of damage, bait acceptance and the presence of nontarget wildlife.

Treatment

1. The county agricultural commissioner or his staff should be aware of the conditions at the site of application and in a position to direct and control the manner in which the application is made.
2. Aerial baiting should not occur on the same parcel of land more often than once every two years with the same toxicant.
3. No treatment shall be made when wind velocity impairs effective bait placement.
4. No treatment should be made when fields are muddy, have standing water, or when rain is expected within 24 hours.
5. Treated bait shall not be applied near farm buildings or over water supplies.
6. Ground-to-air communication shall be in use during treatment.
7. The aircraft baithopper shall be:
   a. Thoroughly cleaned before the first baiting of the program, after final baiting of the program, and if baiting hopper has been used for other pesticides during the program.
   b. Emptied of bait at the end of each day's operation and bait stored in locked container.
8. The rate of application shall be monitored daily by measuring bait dispersal in the treated areas.
9. All accidentally spilled grain bait *shall* be cleaned up immediately.

Post-Treatment

A written evaluation should be made of representative areas describing the degree of control and any observed effects on nontarget wildlife.

APPENDIX H

STATE OF CALIFORNIA—THE RESOURCES AGENCY

EDMUND G. BROWN JR., Governor

DEPARTMENT OF PARKS AND RECREATION

P.O. BOX 2390
SACRAMENTO 95811

(916) 322-2204

April 12, 1977

Ms. Dolores Brown
Jones and Stokes Associates, Inc.
2321 P Street
Sacramento, California 95816

Dear Ms. Brown:

The Office of Historic Preservation has reviewed the Draft Environmental Impact Statement for the proposed ground squirrel control project at Fort Ord Complex in Monterey County.

Thank you for the opportunity to provide comments in accordance with the National Historic Preservation Act of 1966. My staff has reviewed the Draft Environmental Impact Statement and concurs that the proposed squirrel eradication program will not affect existing cultural resources.

If you have any questions, or if we can be of any further assistance in this matter, please do not hesitate to contact Eugene Itogawa of my staff at (916) 322-2204.

Sincerely,

Knox Mellon ub

Dr. Knox Mellon
Historic Preservation Coordinator

G-2/1262

Advisory Council on
Historic Preservation
1522 K Street N.W.
Washington, D.C. 20005

March 9, 1977

Colonel Charles L. McNeill
Director, Facilities Engineering
Office of the Director of Facilities
Engineering, Headquarters
Department of the Army
7th Infantry Division and Fort Ord
Fort Ord, California 93941

Dear Colonel McNeill:

This is in response to your request of February 1, 1977 for comments on the draft environmental statement for ground squirrel control, Fort Ord Complex, Fort Ord, California. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that while you have discussed the historical, architectural and archeological aspects related to the undertaking, the Council needs additional information to adequately evaluate the effects on these cultural resources. Please furnish additional data indicating:

I. Compliance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f, as amended, 90 Stat. 1320). The Council must have evidence that the most recent listing of the National Register of Historic Places has been consulted (see Federal Register, February 1, 1977 and monthly supplements each first Tuesday thereafter) and that either of the following conditions is satisfied:

A. If no property included in or eligible for inclusion in the National Register is affected by the project a section detailing this determination must appear in the statement.

B. If a property included in or eligible for inclusion in the National Register is affected by the project, the statement must contain an account of steps taken in compliance with Section 106, as amended, and a

The Council is an independent unit of the Executive Branch of the Federal Government charged by the Act of October 15, 1966 to advise the President and Congress in the field of Historic Preservation.

comprehensive discussion of the contemplated effects on the property. (Procedures for compliance with Section 106 are detailed in the Federal Register of January 24, 1974.)

II. Contact with the State Historic Preservation Officer.

The procedures for compliance with Section 106, as amended, of the National Historic Preservation Act of 1966 and Executive Order 11593 require the Federal agency to demonstrate consultation with the appropriate State Historic Preservation Officer. The State Historic Preservation Officer for California is Herb Rhodes, Director, Department of Parks and Recreation, P. O. Box 2390, Sacramento, California 95841.

Should you have any questions or require any additional assistance, please contact Michael H. Bureman of the Council's Denver staff at P. O. Box 25085, Denver, Colorado 80225, telephone number (303) 234-4946, an FTS number.

Sincerely yours,

Michael H. Bureman
for
Louis S. Wall
Assistant Director, Office
of Review and Compliance

APPENDIX I

RECREATIONAL USES AND IMPACTS

The Army's land management program is based upon the multiple-use concept which consists of three broad areas, one of which is outdoor recreation. Of the three installations, Camp Roberts is used the least for recreation. The Fort Ord Complex plays an important role in recreation for the nearby communities.

Recreation on Fort Ord is estimated at 1 million use-days in 1976 (Massera, pers. comm.). This includes about 138,000 use-days associated with the Laguna Seca Raceway.

The over 4 miles of beach on Fort Ord provide for surf-fishing, beach-walking, clamming, bird-watching, and beach-combing. Inland unimproved land provides for hunting and fishing, horseback riding, field dog trials, model airplaning, bird-watching, nature study and photography. The improved outdoor recreation areas are utilized most extensively and include the East Garrison Picnic and Army Travel Camp, the Boy Scout Camp, the "Varmints" mini-bike area, and the Laguna Seca Raceway. During 1975 over 15,000 people utilized the picnic area and travel camp facilities. Some 400 members of the Fort Ord Rod and Gun Club recorded over 4,500 man-days of outdoor recreation use during 1975. That same year there were over 1,000 hunting and fishing permits issued at Fort Ord. The Laguna Seca Raceway in 1974 drew over 138,000 persons in three races of international importance (U. S. Dept. Army, 1975).

Fort Ord's scouting facilities were reportedly used by over 10,000 girl and boy scouts during the previous 3 years (U. S. Dept. Army, 1975). The facilities include approximately 100 acres of rolling hills, a meeting room, barbecue pits and sanitary facilities. The camping area is used nearly every weekend (spring through fall) by up to 100 scouts.

The principal form of outdoor recreation at Fort Hunter Liggett is hunting and fishing. The published figures for 1973 were 3,992 man-days for fishing and 12,891 man-days for hunting. From the years 1963 to 1973, over 80,000 hunter-days and 20,000 angler-days have been enjoyed on the Fort (U. S. Dept. Army, 1973).

Many out-of-state visitors are attracted to the San Antonio Mission, the surrounding buildings and interesting mission grounds. Mission San Antonio de Padua, the Indian painted cave, the Los Ojitos adobe, and the San Miguelita Rancho are but a few historical sites which draw visitors to Fort Hunter Liggett.

The historical sites are favorites of professional and amateur photographers alike. Wild flowers in the spring and wildlife the year-round are popular subjects of photographers. In years of adequate rainfall, the wild flowers are particularly plentiful. In 1973 a number of organizations chartered buses to see the wild flowers, with Fort Hunter Liggett being part of the tour (U. S. Dept. Army, 1973).

The proposed action, or Alternatives I and II, would probably necessitate a temporary halt to recreational uses while the control program is underway. This would not be expected to exceed three weeks at any one of the installations. The loss of 90 percent of the squirrels would adversely influence squirrel-watching and photography. It would also limit the sport hunting of squirrels.

The fish and game species will not be adversely influenced by the proposed action. There is no evidence that sublethal amounts of any of the proposed rodenticides, if consumed by game, would be detrimental to man when used for food. Evisceration would reduce all hazard of zinc phosphide and cooking would assist in the breakdown of 1080.

The psychological effect of the proposed action, however, may cause some hunters and fishermen to refrain from using the game resources if they are aware that rodenticides have been used on the property.

Similarly the fear of contracting plague may keep recreationers away from the installation. The publicity already received through newspapers and other media concerning the high squirrel population and the threat of plague may have an impact on user days.

The no-action alternative could increase the possibility of plague in squirrels and in man. An actual plague outbreak could result in the quarantining of the installations. This would bring recreational uses of the installations to a halt for the period of quarantine. The possibility of a hunter contracting plague directly from handling shot squirrels or rabbits cannot be ruled out.

The economic impact on the surrounding communities through the loss of visitors to the area is not known.

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ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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APPENDIX J

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Environmental News

O'Neill (202) 755-0344

FOR IMMEDIATE RELEASE TUESDAY, MARCH 29, 1977

WILDLIFE EFFECTS OF 1080 PESTICIDE TO BE TESTED IN CALIFORNIA

Can a highly toxic pesticide be safely used to control undesirable rodents such as ground squirrels and field mice without affecting other wildlife such as foxes, badgers, owls and vultures?

That's the question that Federal and California State researchers will attempt to answer soon in a carefully controlled field study in parts of Tulare County, California. Tulare is located in the center of the State, approximately midway between Los Angeles and San Francisco.

The test, expected to begin in mid-April, will consist mainly of tracking wildlife such as foxes, badgers, skunks, owls, quail and other birds to determine if they are harmed by the normal airplane and ground application of the pesticide "1080." The principal target pest for 1080 in California is the ground squirrel.

The test will be a cooperative effort among the U.S. Environmental Protection Agency, the U.S. Interior Department's Fish and Wildlife Service, and the California State Department of Food and Agriculture. The estimated $130,000 cost of the study will be funded by EPA.

The pesticide "1080"--chemical name sodium fluoroacetate--is a tasteless, odorless toxin used in several western States for curbing squirrels, mice, rats and other rodent pest populations.

(more)

Return this sheet if you do NOT wish to receive this material ☐, or if change of address is needed ☐ (indicate change, including zip code).

EPA FORM 1510-1 (REV. 6-72)

R-25

Ground squirrels, which look like common tree squirrels but nest in ground burrows, are believed by many farmers, health experts and others to cause significant crop damage, and compete with livestock for grasses and other forage. They may also, in certain densities, increase the likelihood of people contracting bubonic plague disease from fleas that infest the squirrels.

The most common method of applying 1080 for ground squirrel control is to treat grains such as oats and barley with a diluted, liquid form of the pesticide and to spread this bait on the ground by airplane or ground equipment. Buv many scientists and environmentalists believe that this use of 1080 also kills unintended wildlife that either eat the bait directly or that die by feeding upon animals with lethal 1080 residues in their tissues.

In December 1976, EPA announced an in-depth inquiry into the risks and benefits of 1080 and another frequently used rodenticide, strychnine. This inquiry is the first step in an evaluation process to determine whether some or all uses of these pesticides pose unreasonable adverse effects to the environment. "The California test should provide hard scientific information to help decide these issues," said EPA pesticides chief Edwin L. Johnson.

One unique aspect of the test will be the use of small radio transmitters attached to wildlife such as foxes, badgers, skunks, hawks, quail, owls and vultures to track and locate them. The transmitters will range from pencil eraser-sized for quail to silver dollar-sized for foxes. They will emit electronic signals that can be monitored by field technicians to indicate if the animal is alive or dead. Conventional plastic and aluminum tagging bands will be used as well. If any deaths occur, the carcasses will be recovered and examined to determine the cause of death.

The test will continue through the spring and summer. Final results are expected this fall. Two sections of Tulare County farm or ranch land between 5 and 20 square miles will form the test plots. These areas will be part of the normal rodent control program administered by the County Agricultural Commissioner. No additional amounts of 1080 will be applied because of the wildlife study.

A more thorough description of the test may be obtained from Richard Tucker (703 / 557-7494), U.S. Environmental Protection Agency, Crystal Mall #2, Office of Pesticide Programs (WH-568), 1921 Jefferson Davis Highway, Arlington, Virginia 20460.

# # #

R-25

APPENDIX K

OFFICE OF THE SECRETARY
RESOURCES BUILDING
1416 NINTH STREET
95814
(916) 445-5656

Department of Conservation
Department of Fish and Game
Department of Navigation and
Ocean Development
Department of Parks and Recreation
Department of Water Resources

EDMUND G. BROWN JR.
GOVERNOR OF
CALIFORNIA

Air Resources Board
Colorado River Board
San Francisco Bay Conservation and
Development Commission
Solid Waste Management Board
State Lands Commission
State Reclamation Board
State Water Resources Control Board
Regional Water Quality Control Boards
Energy Resources Conservation and
Development Commission

THE RESOURCES AGENCY OF CALIFORNIA

SACRAMENTO, CALIFORNIA

AUG 4 1976

Colonel Dean R. Paquette
Acting Director of Facilities Engineering
Corps of Engineers
Department of the Army
Office of the Chief of Engineers
Washington, D.C. 20314

Dear Colonel Paquette:

The California Department of Fish and Game has reported to me that your observations of extremely high populations of ground squirrels on Hunter-Liggett and Camp Roberts are correct. They have not assessed the ground squirrel population levels at other Camps of the Fort Ord Complex nor did the mid-April, 1976 meeting on the ground squirrel problem address itself to any military installations other than Hunter-Liggett and Camp Roberts.

The questions you enumerated do not relate entirely to this Agency; however, you have also written to the Agriculture and Services Agency and that is the appropriate state agency to answer questions relating to the need to control ground squirrels and to the recommended methods and materials for their control (your question "a").

Question "a": Is the ground squirrel population at Camp Roberts and Hunter-Liggett out of balance and needs to be controlled? If so, on what basis?

Answer: Wild rodent populations are rarely stable enough to be considered "in balance" for more than very short periods. Normally they fluctuate in their abundance, sometimes violently, between high and low levels. No matter what you do at the two military camps of concern, your ground squirrel population will decline rapidly from its present high population level to either a low or very low level. This will be determined by the weather or disease. It may happen this year or it might not occur for several years. An intensive ground squirrel control program would simply speed up this inevitable occurrence.

Ground squirrels do not need to be controlled for wildlife purposes except under rare circumstances such as where water controls or other structures are being weakened or undermined or where ground nesting birds are being established and egg depredation is excessive.

D to Incl 2

Question "b": Have ground squirrels caused adverse effects on beneficial wildlife, endangered species and domestic animals?

Answer: Wildlife studies on quail and ground squirrel relationships have shown that in certain areas and under certain conditions ground squirrels can be a very destructive nest predator on quail eggs. Normally this is not the case and specifically, at Camp Roberts and Hunter-Liggett, field biologists of the Department of Fish and Game report that both quail and ground squirrels have been enjoying high population levels since the first of a series of moderately wet winters starting in 1972-73. This past winter and spring were extremely dry and the field biologists report poor quail nesting success. The point is that weather, not ground squirrels, is the important factor on Camp Roberts and Hunter-Liggett under recent and present conditions.

Two species on the federal list of endangered wildlife that inhabit Camp Roberts and Hunter-Liggett and that are susceptible to certain rodent control toxicants are the California condor and the San Joaquin kit fox. Both of these species are susceptible to strychnine. The kit fox is susceptible to compound 1080 (sodium monofluoroacetate). Both species feed on ground squirrels but not as a major food item. The absence or presence of ground squirrels is of little importance to these two endangered species.

The relationship between ground squirrels and domestic animals can best be answered by the Agriculture and Services Agency.

Question "c": Are ground squirrels causing any emergency situation to exist pursuant to Executive Order 11870?

Answer: Not as far as the Resources Agency's interests and responsibilities are concerned.

Question "d": Do ground squirrels need to be controlled, . . . by what methods and materials (short-term measures and long-term solutions)?

Answer: As previously stated, this should be answered by the Agriculture and Services Agency. The Department of Fish and Game is very active in pesticide regulatory affairs in California, but this is done in an advisory capacity through the State Department of Food and Agriculture and in turn through the County Agricultural Commissioners. The Department of Fish and Game is also involved in the development of plant and animal control programs using pesticides. Their participation in this instance is to build into these programs the best possible safeguards for nontarget species. Particular care is exercised to protect rare, endangered and threatened species from any untoward affects of any vertebrate pest control program. A special review procedure has been established to screen out or modify pest control programs potentially harmful to this group of animals.

Because both condor and San Joaquin kit foxes are classified as endangered and both may be found on the [illegible] area, the following program [illegible] are proposed. Do not use strychnine squirrel baits anywhere on either Hunter-Liggett or Camp Roberts. If 1080 squirrel baits are to be used, no bait should be placed within one mile of active kit fox dens. No other rodenticide should be used without evaluation of hazard to nontarget wildlife.

Should you desire further assistance in evaluating the feasibility or side effects of the squirrel control program, please feel free to call on the services of the Department of Fish and Game.

Sincerely,

Claire T. Dedrick

Secretary for Resources

cc: R. Kahler Martinson
Regional Director
U. S. Fish and Wildlife Service

Ms. Rose Bird
Secretary for Agriculture and Services

E. C. Fullerton, Director
Department of Fish and Game

COMMENTS AND RESPONSES TO THE DRAFT EIS

Introduction

The Draft EIS (DEIS) for the proposed ground squirrel control at Fort Ord was filed with the Council on Environmental Quality on February 5, 1977. A 45-day review period was established for acceptance of comments. Extensions were granted on request to individuals who would not have adequate time to prepare their comments within the 45-day review period.

The Office of the Facilities Engineer distributed 375 copies of the DEIS to governmental agencies with responsibilities or interests in the proposed action and to representatives of all interested citizen organizations and numerous individuals. Copies were placed in the main libraries of Monterey and San Luis Obispo Counties and were available at the Office of the Facilities Engineer, Fort Ord, California, for review.

A public meeting was held in King City at 7:00 p.m., Thursday, February 24, 1977 to discuss the DEIS. The hearing lasted approximately five hours, and 39 presentations were made. All the presentations made are acknowledged or responded to in this section. A verbatim transcript of the proceedings was made and is available for public inspection.

Over 100 written comments on the DEIS were received. They included statements made at the public hearing, petitions with many signatures, general letters expressing public opinion, and letters with specific substantive questions and comments.

Due to the large number of comments and the overlap among them, only the representative letters with detailed substantive questions and comments and the letters that addressed the widest variety of issues were published in the text.

Substantive letters representative of public concern are included in this section and grouped by federal agencies, state and local agencies, organizations and individuals. Comments or questions requiring some form of response have been marked with a heavy line and numbered. Those paragraphs which appear to warrant some discussion rather than changes in the EIS test, appear as boxed entries immediately following the letter or statement. Those comments which lead to change in the text are marked in the margin changed, or changed with the page number where the change is made. Comments which did not lead to changes in the text are acknowledged by noted in the column next to the paragraph. In some cases the reader is referred to a pertinent page in the text.

The remaining letters and public hearing comments were also analyzed and included in a table of general comments. Most of these letters did not directly comment on the draft or do not require a response from the Army. The concerns of these letters were recorded by categories in the following table. Thus, even if a letter is not reproduced, it has been acknowledged and the issues contained therein have been answered by responses in the most substantive letters.

The Department of the Army wishes to express its appreciation to all commenting agencies, groups and individuals for the time and effort spent in reviewing the DEIS. All comments will be considered by the Department in making decisions regarding a ground squirrel control program.

Public Hearing Summary

A public hearing was held at the County Fairgrounds in Monterey County on February 24, 1977 at 8:00 p.m. This meeting was attended by approximately 300 persons, who completed attendance cards.

The hearing was conducted by Col. McNeill of the Engineering Facility, Fort Ord. Following his opening remarks and comments by Col. O'Shei of the Sacramento District Office of the Corps of Engineers, Mr. Robert L. Jones of Jones & Stokes Associates presented a review statement of the DEIS.

The hearing was then opened to comments and statements from the audience with an attempt to limit oral presentation to three minutes. Thirty-nine statements were presented, of which 22 were critical of the proposed action and/or the DEIS. Fifteen statements supported the proposed action and/or the DEIS, and two witnesses took no position regarding the proposed action. The objections may be generally categorized as follows:

1) Opposition to the use of 1080 under any circumstances.
2) Concern with impacts to threatened and endangered species.
3) Concern with impacts to other non-target species.
4) Request that present grazing practices be modified or that grazing be terminated.
5) Belief that land management should be more thoroughly evaluated as an alternative ground squirrel population control measure.
6) Belief that the present ground squirrel population and plague information did not represent an emergency.

Testimony was only taken orally, and no rebuttals or discussions of specific challenges to the proposed action were made except to clarify information.

The hearing adjourned at midnight and the recorded transcript of the hearing and written statements submitted by the audience were collected and returned to Fort Ord for processing, review and answering.

The transcript, because of its bulk, is not included in this EIS, however is available at Fort Ord for inspection.

AD-A071 161 INFANTRY DIV (7TH) FORT ORD CA F/G 6/6

GROUND SQUIRREL CONTROL, FORT ORD COMPLEX FORT ORD, CALIFORNIA.(U)

APR 77 C L MCNEILL

UNCLASSIFIED NL

4 OF 5

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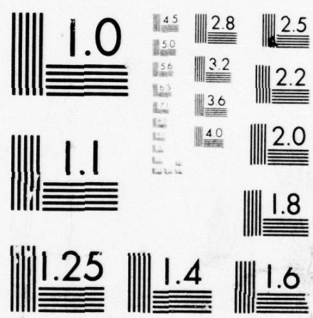

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

GENERAL COMMENTS RECEIVED ON DRAFT EIS

	Supports 1080 and/or EIS	Opposes 1080 and/or EIS	Overgrazing	Plague	Nontarget Impacts	Review Changes and/or Extensions	Suggests Alternatives	Other
GOVERNMENTAL AGENCIES								
U. S. Department of Transportation F. E. Hawley, Regional Administrator								x
Member of Congress Leon E. Panetta						x		
28th Assembly District Henry J. Mello						x		
California Department of Fish and Game William Griffith								x
San Luis Obispo County Health Department Mike Doherty	x							
Monterey County Agricultural Commissioner Richard Nutter	x							
PRIVATE ORGANIZATIONS								
League of Women Voters, San Luis Obispo County, California Dorothy Conner						x		
California Native Plant Society Ralph C. Baker		x			x		x	
Sierra Club, Ventana Chapter Betty S. Davis, Ph.D.		x		x	x	x	x	
Monterey County SPCA Thomas A. Little		x			x			
Monterey Bay Area Veterinary Medicine Association David R. Stroshine, DVM		x			x			
Cholame Township Sportsmen Association Mrs. Dorothy Fleig		x			x		x	
National Audubon Society Cynthia E. Wilson						x		
Valley Historical Association Rachel Gillett, San Antonio		x						
N. Cuesta Audubon Mrs. Thomas Collins					x		x	
Society for Animal Protective Legislation Christine Stevens		x				x		

	Supports 1080 and/or EIS	Opposes 1080 and/or EIS	Overgrazing	Plague	Nontarget Impacts	Review Changes and/or Extensions	Suggests Alternatives	Other
Sierra Club, Bay Chapter Pamela Ferris-Olson						x		
Salinas Bowmen Roy E. Slater							x	
Animal-Kind, Inc. Ann Gonnerman		x						
International Society for Protection of Animals Nick Carter				x				
Animal Protection Institute Gary Paul Pike		x	x		x		x	
Animal Welfare Information Service Gwendolyn R. May		x			x			
Monterey County Farm Bureau William Barker	x							
Monterey Peninsula Audubon Elgin B. Hurlbert		x			x			
California Cattlemen's Association Floyd M. Grigory	x							
Monterey Bay Veterinary Medicine Association Dr. Gerald R. Petkus		x		x	x			
<u>PETITIONS</u>								
Timothy M. Murphy & friends (7 signatures)		x			x			
Priscilla Nesbitt, et al. (7 signatures)		x	x		x			
Richard Cooper, et al. (10 signatures)		x	x					
Carl Davis, et al. from Salinas High School (39 signatures)		x			x			
Tina Bricker, et al. (over 200 Monterey County resident signatures)		x			x			
<u>INDIVIDUALS</u>								
Timothy J. Owens		x						
Marialice Chawpe		x			x			
Frances Boeri		x						
Hubert Farley		x					x	

	Supports 1080 and/or EIS	Opposes 1080 and/or EIS	Overgrazing	Plague	Nontarget Impacts	Review Changes and/or Extensions	Suggests Alternatives	Other
Will J. Erickson		x					x	
J. T. Hollister, DVM		x			x			
Mr. and Mrs. J. A. Johnson		x		x	x			
Bobbie Harms		x	x		x			
Mr. and Mrs. D. K. Davidson		x			x		x	
The Cat's Whiskers (Evelyn Nolt, Paulla Rogers, Phillipa Hastings)		x						
Anita M. Hackett		x			x			
Roland W. Scheffler							x	
Jeanne Bernier					x			
Ian McMillan			x			x		
Wayne S. Shiver, Lt. USN		x	x					
Mr. and Mrs. Edward Graves		x			x			
Craig and Eileen Cunningham		x						
Mrs. Victor M. Colton						x		
Mr. and Mrs. Alfred Bequette		x			x			
John and Suzella Cole		x			x			
Ann Nowell		x				x		
Majorie Wisecarver		x			x	x		
John A. Osborn	x							
William J. Francis		x			x			
Shirley Vergeer		x			x		x	
Cathleen A. Telanik		x			x			
Jack Arnold		x						
Gertrude P. Worner		x						
Michael Bronson		x	x					
Mr. and Mrs. James R. Beeman		x						
Anne Armstrong		x	x		x			
Mr. and Mrs. L. G. Jones		x			x			

	Supports 1080 and/or EIS	Opposes 1080 and/or EIS	Overgrazing	Plague	Nontarget Impacts	Review Changes and/or Extensions	Suggests Alternatives	Other
Richard Spotts		x			x			
Marjorie Fontana		x			x			
Harold Miossi		x	x					
William H. Smart	x							
Linda C. Harris		x			x			
Kathleen A. Blount		x			x			
Terrie L. Gray		x			x			
Evelyn Nolt		x			x			
Mrs. Julian F. Rowe		x			x			
William S. Lindsay		x	x	x				
Charlotte P. Anderson		x			x			
William Martella	x							
John Davis			x	x				
Theo J. Maggini	x							
Mike Orradre	x							
John W. Natwick			x				x	
Conrad E. Marion		x			x		x	
Edward L. Balengee		x	x		x		x	
Hilary Hinckley							x	
Joyce E. Raye		x			x		x	

LETTERS OF COMMENT FROM FEDERAL AGENCIES:

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.

REFERENCE OR OFFICE SYMBOL	SUBJECT
[illegible]	Draft Environmental Impact Statement February 1977 (Ground Squirrel Control)

TO Commander 7th Inf Div & Ft Ord ATTN: [illegible] Fort Ord, CA 93941

FROM Deputy Post Commander Headquarters Fort Hunter Liggett, CA 93928

DATE 11 March 77 CMT 1

Concerning the proposed action and alternatives I consider alternative 2 unacceptable. Alternative 2 provides protection for the cantonment area and adjacent private property owners with no controls over the so called open range lands. However, what is called open range land is the primary training and test area and it is in this training and test area that the largest human habitation occurs at Fort Hunter Liggett. When evaluating the potential health threat I consider it to be the greatest to the troops bivouacking in the training areas. It is in this open range land where the greatest squirrel population and attendant fleas exist.

[illegible] J. [illegible]
COL, IN
Deputy Post Commander

1

1. Alternative II as well as the proposed action and other alternatives, will be accompanied by a flea control program applicable to any areas (including open range) where military personnel may be in contact with fleas, potentially carrying the plague organism.

A full program of surveillance and flea control has been outlined. Page 155.

DEPARTMENT OF THE ARMY
HEADQUARTERS
7th INFANTRY DIVISION AND FORT ORD
FORT ORD, CALIFORNIA 93941

S: 22 March 1977

AFZW-FE

31 January 1977

SUBJECT: Draft Environmental Impact Statement, Ground Squirrel Control, Fort Ord Complex, California (RCS DD-H&E (AR 1327))

Commander
FORSCOM
ATTN: AFEN-FE
Fort McPherson, GA 30330

1. Reference: Chapter 2, AR 200-1.

2. Forwarded for your review and comments are ten copies of subject Draft EIS. Seventy copies were hand-carried to HQ DA this date for distribution.

3. A Public Hearing has been scheduled for 7 p.m., 24 February 1977, at King City, California. A copy of the Public Hearing Announcement is attached.

4. Request your comments be submitted to this office by 22 March 1977. Also, please advise if you will have a representative at the meeting.

FOR THE COMMANDER:

11 Incl
as fwd sep

CHARLES L. McNEILL
Colonel, CE
DFAE

COMMENTS - Draft EIS, Ground Squirrel Control, Fort Ord Complex, CA, Feb 77

1 1. General

One major justification for the use of 1080 over other chemicals is the desired efficacy. Yet, zinc phosphide with a projected efficacy of 60% is planned for use and considered acceptable on open range land of Fort Ord. Clarification of this apparent inconsistency is suggested.

2 Changed 2. Page iX, Description of the Action (Summary)

Description of action is very general with emphasis on reasons for action. Description could be more quantitative.

3 Noted 3. Page Xii. The Summary Sheet

Include a list in final EIS of sources from which written comments have been received. Also, list the date Draft EIS was filed with CEQ.

4 Changed 4. Page 1, Project Description

More quantitative information on acreage and amounts of chemicals is desirable. This section should also list and discuss the benefits to be derived from the proposed action. Reducing the possibility of installation quarantine closure and its economic and mission impact should also be discussed.

5 Changed 5. Page 13, Ground Water

Reference to Fort Ord Mission Changes, Draft EIS, 1975 implies the document has been published when it has not.

6 Changed 6. Page 14, 4th paragraph.

Refers to "normal" water. "Normal" water should be better defined.

7 Page 95 7. Page 8.7 Land Use Relationships

Since the proposed action conflicts with policy (Exec Order) reconciliation should be discussed IAW paragraph 2-12b of AR 200-1.

8 Changed 8. Page 161, Last sentence of first paragraph.

The "Special efforts" to locate Kit fox dens should be described.

COMMENTS - Draft EIS, Ground Squirrell Control (contd)

9 9. Page 194, Last four paragraphs

These paragraphs list recommendations, but do not indicate what will be implemented.

10 Changed 10. Page 203, Glossary

Add the following to the Glossary.

TERMINOLOGY	PAGE
1080	iX
Primary poisoning	Xi
Raptor	128
Chemo-sterilants	133
Fossorial	155
Eviscerate	157

1. Zinc phosphide is considered acceptable; however, it is definitely less effective than 1080 chiefly as a result of animals developing bait shyness.

9. It is not the function of an EIS to make decisions, but rather present the most feasible alternatives and make recommendations.

DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
WASHINGTON, D.C. 20380

IN REPLY REFER TO
LFF-2-CKG:ed
23 MAR 1977

From: Commandant of the Marine Corps
To: Commander, Fort Ord, Fort Ord, California 93941

ATTENTION: Director of Facilities Engineer

Subj: Draft Environmental Impact Statement, Ground Squirrel Control, Fort Ord Complex, California dtd Feb 77

Ref: (a) Assistant Secretary of the Army ltr dtd 21 Jan 77

1. By reference (a), this Headquarters was requested to review and comment on the subject environmental impact statement (EIS). As presented in the EIS, the Department of the Army has been tasked as the lead Department of Defense component in developing a plan to control plaque-susceptible rodents. Consequently, it is anticipated that the program proposed by this EIS will guide other Defense installations in the conduct of similar control operations if needed. In view of the foregoing, the following comments are provided for your consideration.

2. The rationale presented on page 5 of the EIS for conducting ground squirrel control operations, is the determination that a threat to human health exists. Several sources, such as the California Department of Public Health on page 77, recommend that ground squirrel control be accompanied by flea control. The plan addresses such a requirement for the treatment of "areas of human activity" and "areas of special concern". However, the plan does not establish a clear procedure for addressing the same public health concern in treating "open range" areas.

1 3. It is, therefore, suggested that ground squirrel control operations conducted in "open range" areas as an exception to Executive Order 11870, unequivocally require either, (1) that treatment be proceeded or accompanied by flea control, or (2) that treated areas be quarantined as cited on pages 2, 77 and 148.

changed, page 163

2 4. Further, it is the view of this Headquarters that because of the relationship between the condition of vegetation and ground squirrel populations, that the EIS address the salient aspects of achieving a measure of ground squirrel population control through the management of the vegetative cover in the

Subj: Draft Environmental Impact Statement, Ground Squirrel Control, Fort Ord Complex, California dtd Feb 77

"open range" areas. In this regard, it is suggested that such information made available from the "range and related resource inventory and condition report", cited on page 84, be included in the final EIS.

G. L. Bartlett
G. L. BARTLETT
By direction

Copy to:
COMNAVFACENGCOM (20r) (104B)

2. The study in question will not be completed prior to publication of the final EIS.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20201

MAR 22 1977

Commander
Attention: Director of Facilities
Engineering
Fort Ord, California 93941

Dear Sir:

This Department has reviewed the draft Environmental Impact Statement on ground squirrel control at the Fort Ord complex in California, and offers the following comments:

1 Noted

1. We recommend the use of zinc phosphide rather than 1080 as the rodenticide of choice in buffer strip areas (alternative 2). This would be an effective short-term approach in minimizing the threat to public health and consistent with the Army's assessment presented in the tables on pages 189 and 191. The use of 1080 in a buffer zone adjacent to areas of human use would be justified provided that zinc phosphide does not prove to be an effective means for minimizing the possibility or reinfestation and threat to human health. We feel the use of 1080 solely to prevent crop damage would be in violation of the Executive Order since there is insufficient evidence to support such usage other than for "the protection of health or safety of human life."

2 Noted

2. On page 198, the Army states that "To achieve long-term gains, a repeated control of the ground squirrel population may be necessary, probably every 2 to 3 years, with 1080 and every year or possibly every two if zinc phosphide is used, since the ground squirrel residual number will always be sufficient to repopulate the area within that period of time." We strongly disagree with this approach in that (1) it treats the symptoms of the problem, but does not deal directly with the reason for the problem, and (2) may have cumulative substantial long-term impacts on the quality of the environment. Therefore, we strongly urge prompt implementation of the recommendations made on September 9, 1976, by Mr. Nathaniel Reed, Assistant Secretary for Fish and Wildlife and Parks in a memorandum to the Army which has been reproduced on page 101.

3

Specifically, Mr. Reed recommended that:

> "Before this practice (use of rodenticide 1080) is adopted as a permanent procedure, a better understanding is needed of the dynamics of the ground squirrel population at the Fort Ord complex. Numerous studies of ground squirrels and other range rodent populations suggest that a number of environmental factors other than the absence of toxicant control are responsible for population eruptions or unusually high population densities sustained over a period of time. By identifying these factors, it is possible to develop management plans which are cost effective and environmentally safe with minimal need for toxicant use or other control techniques. I recommend that appropriate studies be conducted to determine what these management plans should be."

This course of action should be considered as an integral part of, and initiated concurrently with, any short-term measures or control procedures designed to protect the public health.

4 Page 86

3. With respect to the references on pages 78 and 109, that cast doubt upon the efficacy of carbaryl as a pulicide, extensive areas in Arizona, Colorado, New Mexico and Wyoming were treated with 10 percent carbaryl dust applied to squirrel burrows for flea control during 1976. Few failures occurred, and all were traceable to errors in application resulting in failure to reach the target organism with the toxic material. In 1975, one failure occurred due to the low toxicity of a formulation that had been on the shelf for over 3 years, then used without evaluation. During 1976, *Diamanus montanus* and *Hoplopsyllus anomalus* were successfully controlled to abate rock squirrel epizootics on 17 Indian reservations in New Mexico.

5

We are aware that many variables can influence the effect of a pesticide formulation in the field and do not question the observations made in the Sierra Nevada by California State Health Department personnel. Last summer the Center for Disease Control suggested that a field trial of 10 percent carbaryl dust against ground squirrel fleas be conducted at Fort Hunter Liggett. We understand that such a trial was carried out by Army personnel in August and September 1976. The results of this trial, together with appropriate data should be included in the impact statement. Our experience shows that carbaryl is equal to DDT in the short-term but, as might be expected, lacks DDT's residual quality.

Sincerely,

Charles Custard

Charles Custard
Director
Office of Environmental Affairs

3. The Army Corps of Engineers is currently supporting a range study which may assist in determing a long range management plan. See page 93.

5. The field trials in question used 2 oz. of 10 percent carbaryl dust per burrow and found it to be effective in controlling the flea population (Marsh, pers. comm.; Johnston, 1977), see page 86.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
100 CALIFORNIA STREET
SAN FRANCISCO, CALIFORNIA 94111

Project No. O-USA-K82000-CA

Charles L. McNeill, Colonel
Director, Facilities Engineering
Department of the Army
7th Infantry Division & Fort Ord
Fort Ord, California 93941

MAR 29 1977

Dear Colonel McNeill:

The Environmental Protection Agency has received and reviewed the Draft Environmental Statement for the Ground Squirrel Control, Fort Ord Complex, Fort Ord, California.

EPA's comments on the Draft Environmental Statement have been classified as Category ER-2. Definitions of the categories are provided on the enclosure. The classification and the date of EPA's comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act. Our procedure is to categorize our comments on both the environmental consequences of the proposed action and the adequacy of the environmental statement.

EPA appreciates the opportunity to comment on this Draft Environmental Statement and requests two copies of the Final Environmental Statement when available.

If you have any questions regarding our comments, please contact Patricia Sanderson Port, EIS Coordinator, at (415)556-6266.

Sincerely,

Paul De Falco

Paul De Falco, Jr.
Regional Administrator

Enclosure

cc: Council on Environmental Quality

Region IX Comments

EPA has reservations concerning certain environmental aspects of the proposed project and that the draft impact statement does not contain sufficient information to assess fully the long term implications or plans of the proposed project.

Specifically, the following comments are provided to assist you in preparation or revision of the final EIS.

1 Noted

1) Of the three alternatives proposed, ground squirrel control alternative 2 as proposed in the current draft EIS, utilizing zinc phosphide, represents a more environmentally sound approach.

2

2) Additionally, insufficient consideration is provided for a long-range management approach for squirrel control or land utilization. The draft EIS indicates a continuing reliance on chemical control from year to year without considering other alternatives.

3

3) EPA announced in the Dec. 1, 1976 Federal Register a notice of, a rebuttable presumption against registration for Compound 1080. In this notice three risk criteria were addressed. These inlcude problems involving acute toxicity, effects on non-target wildlife, and lack of effective antidotes. Until these presumptions are resolved, the use of Compound 1080 should be limited.

Headquarters Comments - Associate Review

While the 271 page document addresses a multiple of concerns, its composition and organization make it difficult to follow. The numerous subdivisions within some of the various topics do not allow for easy interpretation.

4 Noted

Because of the ramifications of massive use of highly toxic materials, the Registration Division favors Alternative 2 for the following reasons:

(1) the use of zinc phosphide and diphacinone in limited areas would result in the reduction of ground squirrels in areas of human activity;

(2) this action would pose a minimum hazard to non-target species;

(3) since plague has not been identified in the ground squirrel populations of the Fort Ord complex there is a minimum of public health concern;

789 513

4 Noted

(4) the number of ground squirrels remaining in untreated areas are limited by intraspecific or other self limiting regulatory factors (as evidenced by the phenomena of population dynamics page 185);

(5) zinc phosphide has been used successfully elsewhere in California to effectively control ground squirrels.

While the Registration Division does not yet have a Federal registration for the use of zinc phosphide to control ground squirrels in California, an application by the U.S. Fish and Wildlife Service is currently under review (initially required environmental chemistry data was lacking). The Fish and Wildlife Service data showed the efficacy of zinc phosphide-treated grain to control the California ground squirrel, except in an area adjacent to almond orchards.

5 Noted

Before the use of 1080 grain can be considered it would be appropriate to await the outcome of the current RPAR against all uses of the product. The fact that 1080 formulations have been used for 20 years does not imply that it is safe nor efficacious. We do not have an equivalent Federal registration for this use pattern. Should the outcome of the current RPAR action (a data gathering process) show that the benefits outweigh the risks, certain use patterns may be sanctioned. However, eventually, Section 3 requirements must be met for all those state products currently not Federally registered. The State of California may be submitting RPAR documents which may or may not be sufficient to fill 1080 data gaps.

6

The environmental impact statement should account for the following:

(1) On the Fort Ord Complex have there been surveys to determine the nature and extent of Norway and roof rat populations? What kinds of control efforts routinely take place? What ectoparasites do these rodents harbor? Since plague is a greater threat when commensal rodents abound in association with man, it is essential to have this information.

Noted 7 Page 151

(2) Pages 139, 171 - Close monitoring of the effects of burrow treatment using 10% carbaryl dust should be stressed. There are flea-host niches where carbaryl has not been effective in killing fleas.

8 Noted, Page 165

(3) Page 150 - Should 1080 be applied it is of the utmost importance to adequately post the treated acreages in addition to announcing this action through local media so that the public is informed. Local residents must be cautioned to keep pets and livestock out of affected areas. Local hospitals, clinics, doctors and veterinarians should also be informed of the toxicants in use. A complete list of the active ingredients by percentage would expedite treatment in the event of accidental poisoning.

9

(4) Page 84 - We urge implementation of the range and related resource study to develop management plans regarding the livestock grazing. While range management specialists can prescribe how many sheep or cattle should graze per acre in specific areas, not too much is known about the long term effects of grazing on high field rodent densities. Since ground squirrels reportedly favor overgrazed lands, it is of paramount importance to reduce grazing to allow the range to "return to normal." Historically there has been a tendency to rely on pesticides to regain land use solely for grazing privileges.

10 Noted

(5) Page 136 - We concur that the repellent devices which claim to rid an area of ground squirrels are unsupported by scientific support data. Currently the "Amigo" device is being tested at the Beltsville Lab against Norway rats only.

11

(6) Page 139 - In the use of carbaryl, precautions must be taken to guard against any drifting of the material to the areas inhabited or frequented by bees maintained at Camp Roberts.

12

(7) Page 144 - In the EIS, the implication is made that 1080 may be used again, as warranted, within 2-3 years, depending on the density of ground squirrels. How is density defined? This assumes that an "emergency" will continue. It must be remembered that the Executive Order 11643 (11870) is still valid. Affected agencies were convinced to respond to the Army's concern over ground squirrel numbers, the potential threat of plague and the economic damage caused by these rodents. Does the Army anticipate continued use of 1080 even though a similar "emergency" does not reoccur in the future? Further use could also be influenced by the outcome of the RPAR process and the ultimate disposition of the State registration of the product (under Section 3 of amended FIFRA).

290

Noted 13 (8) Page 145 - Clarify whether those areas of human activity only will be visited following the treatment to retrieve ground squirrel carcasses found above ground. If retrieval is attempted in areas outside the carbaryl dusting effort, any personnel handling affected ground squirrels must take special precautions to avoid exposure to live ectoparasites.

Noted 14 (9) Page 146 - Diphacinone is proposed to be placed in "PVC pipe bait boxes." The term "bait station" would be more appropriate since a pipe can hardly be a box. The "bait stations" will require servicing to replenish consumed bait. This is not indicated in the EIS.

15 (10) Page 147 - Fumigants will be used by Army personnel in conjunction with diphacinone in human use areas. However, it should be emphasized that fumigation will be conducted only where ground squirrels are known to harbor. To avoid fumigation of burrows of non-targets (Page 173), a system should be followed whereby identification is made of all burrows to be treated (or not treated). Perhaps those non-target burrows could be flagged since there would, presumably, be fewer of them.

16 (11) Page 110 - Will use of 1080 for ground squirrel on the Fort Ord Complex authorize its use on other military installations even though the Executive Order 11870 is still valid?

Minor points:

	Page No.	Item
Noted 17	IX	3rd Paragraph - Executive Order 11643 was initially issued followed by 11870
Noted Changed 18	113	Correct <u>Pasteurella</u> to <u>Yersina</u>
Noted 19	128	The above ground uses only of strychnine are being presumed against by EPA
Noted 20	252	Even though strychnine is discussed (Page 127), it is not a candidate toxicant considered for use and therefore should be deleted.

2. There is little information other than that provided in the EIS to support other effective alternatives. More research on alternatives is needed.

3. We understand that U. S. Environmental Protection Agency has such a study underway.

6. Commensal rodents, where they exist, are being kept under reasonable control. Commensal rodents are not the issue of this EIS.

9. This is being implemented.

11. The proposed use pattern of carbaryl does not generally expose bees to the insecticide. This problem is discussed on page 195.

12. Results of initial treatment plus many other factors will be considered prior to making a determination on followup control methods.

15. Determination and flagging of nontarget burrows is not feasible.

16. This EIS is written for the Fort Ord Complex. Environmental factors would vary in each installation, including the nature of any ground squirrel problems.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/EC
ER-77/150

MAR 3 1 1977

Dear Mr. Hildebrand:

We have reviewed the Draft Environmental Statement for Ground Squirrel Control, Fort Ord Complex, Monterey and San Luis Obispo Counties, California and have the following comments.

GENERAL COMMENTS

1 The document does not analyze potential impacts on the burrowing owl, a species on the Audubon Society's 1976 Blue List. According to Appendix B in the DEIS, the burrowing owl occurs at Fort Ord and Fort Hunter Liggett. This species is known to utilize ground squirrel burrows. Since these owls usually depend on existing burrows for nesting and shelter, ground squirrel control could result in a reduction of burrows and subsequent reduction of burrowing owl populations. Such a reduction has been observed following prairie dog poisoning activities in Oklahoma; abandoned burrows deteriorated within a year to the extent that they were useless to owls. (Zarn, 1974, "Burrowing Owl," Dept. Int., BLM, Tech. Note Rept. #11). Secondary poisoning of burrowing owls is also a possibility, as they may feed on non-target small mammals incidently killed in treated colonies. The use of 1080 treated bait applied aerially might result in greater exposure of non-target species.

2 We question the method of control. The use of sodium monofluoroacetate (1080) grain bait is being recommended by the Army. We believe that alternative 1, which would substitute zinc phosphide for 1080, should be the control method used. Also the use of zinc phosphide should be evaluated as to effectiveness and associated hazard to non-target species. If it is found that zinc phosphide does not provide satisfactory control, then alternate chemicals should be utilized.

Noted

3 Since neither zinc phosphide or 1080 grain baits are Federally registered for application in the manner proposed for use, the Army should review this problem with EPA.

Changed

4 Several citations are made within the context of the statement to Rare and Endangered Species. This should be revised to read Threatened and Endangered Species. Both the San Joaquin Kit Fox and California Condor are listed by the Secretary of Interior as Endangered Species.

5 It appears from the information contained in the draft statement, that the proposed action will have no adverse effect upon cultural resources in the area. However, since page 28 indicates there are several properties included on, or considered eligible for inclusion in the national Register of Historic Places at Fort Hunter Liggett the State Historic Preservation Officer and the Advisory Council on Historic Preservation should be contacted to determine if any protective measures will be necessary. Documentation of consultation with the State Historic Preservation Officer and the Advisory Council on Historic Preservation should be included in the final statement.

SPECIFIC COMMENTS

6 The U.S. Fish and Wildlife Service is concerned with the possible adverse effects of the proposed project on endangered species and the fact that the Department of the Army has not requested Section 7 consultation with the Fish and Wildlife Service to determine whether the action is consistent with the provisions of Section 7.

Section 7 of the Endangered Species Act of 1973 gives each Federal agency the responsibility to review its activities or programs and to identify any such actions that may affect listed species or their habitat. When a Federal agency identifies activities or programs that may affect listed species or their habitat, the agency should submit a written request for consultation to the appropriate Fish and Wildlife Service Regional Director. The Guidelines for Section 7 Consultation, transmitted to Federal agencies on April 33, 1976, represent an interim measure to furnish a broad and flexible framework within which Federal agencies may prepare internal procedures to fulfill their responsibilities under Section 7. Also available for this purpose are the proposed Provisions for Interagency Cooperation (42 FR 4868-4873), published January 26, 1977.

7 A hypothetical concentration of 1080 (sodium monofluoroacetate) in a water body, following aerial application, is compared to the lethal dose for man and found to be very small (p. 149, par. 1). The potential for undesirable health effects of very small doses should also be discussed.

8 The application of 1080 aerially or by hand would not be closer than 100 feet to streams and reservoirs (p. 149, par. 1). This appears to be a rather small margin of safety for aerial application. It should also be specified whether dry stream channels are included.

9 We agree with the conclusion that potential for adverse impacts on ground water is negligible in areas of confined aquifers (p. 14-15). However, the final statement should indicate whether there are any areas of unconfined aquifers in which the depth to water is very shallow under normal conditions. (The draft states that in some areas of unconfined aquifers, the water table could under the proper conditions rise to the land surface (p. 15). Mitigation in such areas might include choosing times of application to coincide with periods of low water table; this or other measures to minimize impacts should be discussed in the statement. We suggest also that mitigation should expressly include precautions to be taken in the vicinity of wells and springs.

10 The treatment of recreation in the "Impacts" section is inadequate in view of the discussion of recreation on page 2. The final EIS should indicate the amounts of various recreational activities on the military installations involved, and the degree of impact that the proposed action and the alternatives would have.

While the draft EIS makes some analysis of the impacts of the proposed action on target and non-target species, no treatment is given to the recreational considerations involved. Fishing, hunting, and wildlife observation and photography will certainly be impacted by poisoning of non-target species and should be analyzed in that regard.

We feel that the Table of Impacts on page 191 would be improved by including recreation.

Sincerely yours,

Stanley D Doremus

Deputy Assistant Secretary of the Interior

Mr. Bruce A. Hildebrand
Deputy for Environmental Affairs
Department of the Army
Washington, D.C. 20310

1. Even if the ground squirrel population is reduced, there will still be an active ground squirrel population left. These will provide enough abandoned burrows for the burrowing owl population. The burrowing owl may also be capable of digging its own burrows.

2. This recommendation is in conflict with the recommendation of the California Resources Agency, see letter - page 298. We agree that any rodenticide be evaluated and there will be a monitoring evaluation of any rodenticide used in the Fort Ord Complex.

5. The State Historic Preservation Officer was contacted. No adverse effects will be noted if the proposed action or either of its alternatives are implemented. See Appendix H.

6. The Army has had numerous contacts with both state and federal wildlife personnel. Representatives of the U. S. Fish and Wildlife Service (local, regional and national) have met with or corresponded with the Army on the ground squirrel matter. There is no record, however, of a formal request by the Army for USFWS consultation regarding the proposed action.

7. Hodge et.al. (1963) reported two chronic 1080 studies conducted on rats by Miller and his colleagues. One was conducted at 20 ppm in the diet for 12 weeks and the other at .002 percent in the diet for 10 months. The potential for adverse intoxication affects of minute doses of 1080 seems very remote.

8. 1080 will be applied to dry stream channels in May or June, the driest time of the year, in which little or no precipitation is expected until late October and November. Amounts of 1080 possibly entering the stream will be minimal and no indirect adverse impacts would be expected. See page 149.

9. Time of application would coincide with periods of low water-table. Even if ground waters were to rise to the surface, 1) this would occur during the time of year in which 1080 would have been applied 4 or more months earlier and no significant residue would be expected to remain, and 2) even if the total amount of 1080 were diluted by ground water, the concentration would be extremely dilute and would be subject to adsorption on soil and to degradation by soil bacteria and physical processes. Precautions will definitely be taken in the vicinity of wells and springs. See page 149.

10. See page 213 and Appendix I.

DEPARTMENT OF THE ARMY
US ARMY ENVIRONMENTAL HYGIENE AGENCY
REGIONAL DIVISION – WEST
FITZSIMONS ARMY MEDICAL CENTER
DENVER, COLORADO 80240

MAJ Young/wf/943-8090

HSE-MF 18 March 1977

SUBJECT: Draft Environmental Impact Statement (EIS) Ground Squirrel Control, Fort Ord

Commander
7th Infantry Division and Fort Ord
ATTN: AFZW-FE
Fort Ord, California 93941

1. Reference is made to letter, AFZW-FE, Fort Ord, concerning subject above, 1 February 1977.

2. Comments are provided on the Draft EIS.

1 Noted — a. Page X, Paragraph 2. Recommend 1080 be used to control squirrels on rangeland at Fort Ord because of cost effectiveness and less occupational exposure of personnel to zinc phosphide.

2 Changed — b. Page X, Paragraph 2. Reference is made to Letterman Army Research Institute in San Francisco. US Army Health Services Command, (Fort Ord MEDDAC and the US Army Environmental Hygiene Agency, Aberdeen Proving Ground) has the resources and the assigned mission to provide technical support in all aspects of squirrel control including plague surveillance and quarantine.

c. Page 1, Project Description.

3 — (1) How close will 1080 be applied to cantonement, recreational and bivouac areas?

4 Noted — (2) Recommend a buffer zone be established and methods be discussed for controlling squirrels and fleas in these buffer zones.

5 — (3) What precautions are being taken along installation boundaries where civilian residences are contiguous with areas to be poisoned?

HSE-MF 18 March 1977

SUBJECT: Draft Environmental Impact Statement (EIS) Ground Squirrel Control, Fort Ord

6 Noted — (4) Methyl bromide should not be used in housing areas because squirrels may tunnel beneath a house foundation thereby exposing occupant to the fumigant.

(5) See Paragraph 2a above.

7 Changed — d. Pages 47, 48 and 52. Photographs were published in Entomological Survey, Fort Ord and Hunter Liggett Military Reservations, California 93941, 29 April - 3 May 1974 by US Army Medical Laboratory, Fort Baker, California 94965. Recommend credit be appropriately noted.

8 Page 68 — e. Page 61, 4th Paragraph. The majority of ground squirrels are hibernating in the winter months, therefore, the reference to squirrels competing for forage in winter may be invalid.

9 Noted — f. Page 78, 6th Paragraph. A 10% carbaryl dust is also registered for flea control in rodent burrows.

10 Changed — g. Page 78, 8th Paragraph and Page 142, 2nd Paragraph. The US Army Environmental Hygiene Agency, Regional Division-West, Fitzsimons Army Medical Center, Denver, Colorado conducted efficacy test on 10% carbaryl dust in controlling fleas in beechey ground squirrel burrows at Fort Hunter Liggett. The unpublished data indicates that carbaryl will effectively suppress flea population for approximately six weeks.

11 — h. Page 145, 3rd Paragraph. Specify which areas will require poisoned ground squirrel retreival. It may not be physically feasible to search all treated areas.

12 — i. Page 146, Squirrel Control. Fifteen pounds cannot be physically placed in a PVC tube, 30 inches long, at one time. The cost of $5.00 per bait station appears to be excessive for a 30 inch PVC tube.

j. Page 147, Flea Control.

13 Changed — (1) Recommend "Health Department" be changed to read: US Army Surgeon General.

14 Changed — (2) The cost of rotary hand dusters, NSN 3740-00-132-5935 costs $24.23 each versus $125.00 each. Five dusters may be too few.

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

15 Noted

k. Page 148, 1st Paragraph. Recommend area quarantine in squirrel poisoned area without flea control be based on plague surveillance data. The following is proposed for training areas on "open range" where burrow dusting is impractical.

16 Noted

(1) Use carnivore serum data generated from the DA Plague Surveillance Program to determine potential plague activity in the rodent population. Insure that a minimum of 25 carnivores having a limited home range (e.g., badgers, raccoons, skunks, and feral house cats) are collected from squirrel infested training areas.

(2) At random, swab a minimum of 200 beechey ground squirrel burrows from each separate training area. Collect and pool fleas from each training area by placing in a vial containing 2% salive solution. Forward labeled vials to the Plague Branch, CDC, Fort Collins, Colorado for plague isolation.

(3) If the carnivore serum does not demonstrate significant plague titers and the flea pool from individual training areas are negative, the following measures are proposed to minimize plague vector (flea) exposure in squirrel poisoned training areas without flea control.

(a) Allow training maneuvers, including foot traffic; however, personnel should not be allowed to sit or lie on or near squirrel burrows.

(b) Require personnel to apply insect repellent to clothing around the collar, waist, sleeve ends, and trouser blousing.

(c) Allow bivouacking only in squirrel-free areas or areas where burrows have been dusted with carbaryl dust. As a margin of safety a one-fourth mile buffer zone around the bivouac area should be dusted.

(d) Dust burrows around established "foxholes."

(4) In training areas where flea pools are positive or suspected of supporting an active plague epizootic either from significant carnivore serum plague titers or unusual rodent activity, quarantine is indicated until flea control can be accomplished.

(5) In plague positive training areas where flea control is not practical nor feasible, plague immunization may be a last resort alternative.

17 Noted

l. Page 148, 5th Paragraph. Recommend "health officials" be changed to read: US Army Surgeon General.

m. Page 174, Direct Poisoning - Target Species by Carbaryl. See Paragraph 2g above.

n. Page 219. Recommend reference discussed in Paragraph 2d be added as a reference.

FOR THE COMMANDER:

LAURENCE JOHNSTON, Ph.D.
LTC, MSC
Chief, Regional Division-West

CF:
HQDA (DASG-HCH)
HQDA (DAEN-FEB)
Cdr, FORSCOM (AFEN-FE-S)
Cdr, HSC (HSPA-H)
Cdr, Ft Ord (G3)
Cdr, USAEHA (HSE-M)
Cdr, USAEHA (HSE-R)
Cdr, MEDDAC, Ft Ord

3. 200 yards.

5. Where a civilian residence is contiguous with military installation boundaries, no 1080 will be applied within 200 yards.

11. Safety precautions for handling cleanup, disposal of bait-contaminated containers and carcass cleaning disposal will follow the recommendations of the California Departments of Food and Agriculture and Public Health. These will include squirrel carcass retrieval in cantonment and bivouac areas.

12. It is anticipated that the bait stations will initially contain about 8 lbs. of bait. Approximately the same amount will be used to replenish the bait after the initial bait consumption.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
2828 Chiles Road, Davis, California 95616

March 15, 1977

Charles L. McNeill, Colonel, C. E.
Director Facilities Engineer
Fort Ord, Calif. 93941

Dear Colonel McNeill:

We acknowledge receipt of the draft environmental statement for Ground Squirrel Control in Monterey County, California, that was addressed to the State Conservationist on 1 February, 1977, for review and comment.

We have reviewed the above draft environmental statement and find that there are several items in the statement within the realm of the Soil Conservation Service's expertise which we believe need modification. They are as follows:

Noted 1 Page 85 - Medusa Head is not a significant invader species on Fort Ord.

Noted 2 There is significant evidence of erosion related to grazing. In Long Valley gully erosion is due to lack of cover on onset of grazing season. In Gabilan Impact Area, sheet erosion is apparent from too close grazing on slopes and areas of control burning. In the Honey Creek area, rills and small gullies have formed from the compaction and trampling in wet areas and reduced cover on slopes.

We find no conflict with any SCS on-going or planned programs or projects.

We appreciate the opportunity to review and comment on this proposed project.

Sincerely,

Francis C. H. Lum
FRANCIS C. H. LUM
State Conservationist

cc: R. M. Davis, Administrator, USDA, SCS, Washington, D. C. 20250
Fowden G. Maxwell, Coordinator of Environmental Quality Activities, Office of the Secretary, USDA, Washington, D. C. 20250
Council on Environmental Quality, 722 Jackson Place, N.W., Washington, D. C. 20006 - Attn: General Counsel (5 copies)
Eugene Andreuccetti, SCS, Watsonville

LETTERS OF COMMENT FROM STATE AND LOCAL AGENCIES:

OFFICE OF THE SECRETARY
RESOURCES BUILDING
1416 NINTH STREET
95814
(916) 445-5656

Department of Conservation
Department of Fish and Game
Department of Navigation and Ocean Development
Department of Parks and Recreation
Department of Water Resources

EDMUND G. BROWN JR.
GOVERNOR OF
CALIFORNIA

Air Resources Board
Colorado River Board
San Francisco Bay Conservation and Development Commission
Solid Waste Management Board
State Lands Commission
State Reclamation Board
State Water Resources Control Board
Regional Water Quality Control Boards
Energy Resources Conservation and Development Commission

THE RESOURCES AGENCY OF CALIFORNIA

SACRAMENTO, CALIFORNIA

APR 1 1977

Colonel Charles L. McNeill, CE
Director, Facilities Engineering
7th Infantry Division
Department of the Army
Fort Ord, CA 93941

Dear Colonel McNeill:

298

The State of California has reviewed the "Draft Environmental Impact Statement, Ground Squirrel Control, Fort Ord Complex", dated February 1977, which was submitted to the Office of Planning and Research (State Clearinghouse) within the Governor's Office. The review is in accordance with Part II of the U. S. Office of Management and Budget Circular A-95 and the National Environmental Policy Act of 1969.

The State's review was coordinated with the Department of Conservation, Fish and Game, Food and Agriculture, Health, Parks and Recreation, Transportation, and Water Resources; the Air Resources, Solid Waste Management, and State Water Resources Control Boards; and the Energy Resources Conservation and Development and Public Utilities Commissions. Following are the State's comments.

While we are in general concurrence with the findings and proposed actions set forth in the draft statement, we invite further consideration of several points of uncertainty and suggest redirection of emphasis in terms of projected environmental planning.

1 The beneficial impact on agriculture as a result of removal of a large number of ground squirrels from the area should be more clearly stated. It would be helpful to point out that the area serves as a source of repopulation, and control measures will remove the locus of reinfestation of a very large agriculturally significant area which will allow greater use of the land resource.

2 The draft statement does not develop an adequate surveillance component for rodents and ectoparasites. Base line data should be available before the proposed control program is started. These data are essential to the development of reliable post-treatment evaluations.

3 The role of environmental management in disease prevention deserves greater emphasis. Discreet, precise use of chemical control measures is sometimes justified on the basis of risk/benefit balancing. We believe this point has been reached in the areas under consideration. Any proposal, however, recommending wide-scale retreatment of the Fort Ord Complex with sodium monofluoroacetate (compound 1080) every two to three years (draft statement, page 144) should be looked upon with concern. We suggest that the best available talents and resources be applied to mount a sound range management and wildlife conservation program properly recognizing the Land Use Constraints cited on pages 88 and 89 of the draft statement. We believe that exclusive and perpetual reliance upon chemical control technology is incompatible with modern integrated concepts of animal population management and should not be relied upon.

Attached are specific comments.

Thank you for the opportunity to review and comment on the draft statement.

Sincerely,

CLAIRE T. DEDRICK
Secretary for Resources

By L. Frank Goodson
L. FRANK GOODSON
Assistant to the Secretary
Projects Coordinator

Attachment

cc: Director of Management Systems
State Clearinghouse
Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814

(SCH No. 77020823)

SPECIFIC COMMENTS
DRAFT ENVIRONMENTAL IMPACT STATEMENT
GROUND SQUIRREL CONTROL
FORT ORD COMPLEX, CALIFORNIA
SCH NO. 7702083

Noted

4 Page X, paragraph 2. We question the statement that a reduction in ground squirrels would allow heavier stocking of livestock or wildlife like deer. It is our opinion that extremely high numbers of ground squirrels are a result of overgrazed ranges. A reduction in livestock grazing would allow the range to support more wildlife other than ground squirrels. The maintenance of excessive livestock numbers on overgrazed ranges will not allow increased numbers of desirable wildlife even if almost all of the ground squirrels were removed.

Changed Page 16

5 Page 16, paragraph 1. The statement inferring that "bitterbrush" occurs in these counties should be eliminated.

Changed Page 17

6 Page 17, paragraph 2. The California brown pelican is listed as rare. The proper classification is "endangered".

Changed Page 17

299

7 Page 17, paragraphs 5-7. There is no mention of the wild turkey in both Camp Roberts and Fort Hunter Liggett in the woodland and scrub-chaparral habitats. Also, there is no mention of mountain lion and band-tailed pigeon in these habitat types as well as the coniferous forests. These species are potentially susceptible to rodenticides, are extremely important, and are known to range in or immediately adjacent to the proposed areas of ground squirrel control.

Changed

8 Page 19, Table 4. Southern sea otter should have the symbol "T" in the federal status column, and the comments column should read, "along coast from Santa Cruz County to Santa Barbara County". The "T" symbol should be added to the table's footnotes.

9 Page 39, all paragraphs. Several references were made regarding manipulating the habitat to reduce squirrel densities. One study points to a population difference of 4.1 squirrels per acre on closely grazed land and 2.3 squirrels per acre on moderately grazed land. The study states that this is not a significant difference. It is felt, that if a program as desirable as moderate grazing would reduce the squirrel population by 44 percent, it should certainly be included with all of the alternatives.

Noted

10 Pages 79-84. The Department of Fish and Game sent an official report on livestock competition with wildlife to the Army in 1975. This report was not included in the discussion on grazing. The Army has rewritten its leases to solve the problem, but the degree of utilization is still excessive in Camp Roberts and Fort Hunter Liggett. On page X it was noted that grazing was needed to minimize fire hazard. This goal can be obtained by proper grazing, such as has been carried out at Fort Ord in recent years. Formerly, large erosion gullies occurred at Fort Ord, but through fencing and moderate grazing practices they are now gradually disappearing.

Changed, Page 110

11 Page 102, last paragraph, last sentence. The Federal Working Group on Pest Management is no longer is existence. The Regional Pesticides Staff Specialist of the U. S. Fish and Wildlife Service is now responsible for proposed program reviews on certain federal lands and programs. Military lands are not included in his review responsibility, but his recommendations may be solicited.

Noted

12 Pages 128-134. The State would not oppose the alternative use of anticoagulants or fumigants in open range areas if these materials were applied only to active ground squirrel colonies and not applied to burrows utilized by nontarget wildlife or within one mile of active kit fox dens.

Changed, Page 145

13 Page 135, paragraphs 2-4. Shooting was discussed briefly as a method of controlling ground squirrels. While we agree that this method would not do the job alone, it certainly should be used in conjunction with all of the alternatives. Populations found in limited areas, such as dam sites illustrated on page 51, could be controlled by this method.

Noted

14 Page 147, paragraph 5, and page 161, paragraph 1. We concur with the recommendation not to use 1080 baits within one mile of active kit fox dens in order to provide the maximum degree of protection.

Changed, Page 165

15 Page 148, paragraphs 2-5. It is essential for the protection of nontarget fish and wildlife that the Army agrees to use the guidelines as established in the California Administrative Code, California Food and Agriculture Code, and the State Vertebrate Pest Control Handbook. Adequate protection of nongame wildlife necessitates that the ground squirrel control programs be either conducted by, or at least supervised by, the appropriate County Agricultural Commissioner and that recommendations of this Department be included in the adopted program.

Changed, Page 179

16 Page 159, last paragraph. Regarding "Rare and Endangered Species", no consideration was given the southern bald eagle and peregrine falcon. The southern bald eagle occurs in the area almost every spring and the peregrine falcon has been observed nearby.

Noted

17 Pages 176-194. The State would be opposed to the use of zinc phosphides in the buffer zones of Camp Roberts and Fort Hunter Liggett. The Army may expect preventable losses of various seed-eating birds from direct poisoning if zinc phosphide is used in open range areas as described in Alternatives 1 and 2. Numerous species of nongame birds, such as horned lark, gold finch, towhee, sparrow and junco, are very susceptible to zinc phosphide-treated grain baits just as are the grain-eating game birds found at Camp Roberts and Fort Hunter Liggett. These birds are valley quail, mourning dove, band-tailed pigeon, and wild turkey.

Noted, Page 155

18 Page 193, paragraph 2. The proposal for a surveillance, monitoring, and testing plan if a ground squirrel control program is undertaken is an essential element of the total proposed program. Without such an evaluation, changes in the environment or fish and wildlife populations could be attributed, either rightly or wrongly, to the ground squirrel control program.

Noted 19 Page 194, paragraph 1. Recommendations for testing of changes in land use practices to control ground squirrel populations and reduce damage are excellent, and we strongly urge their implementation by the Army.

20 Page 197, paragraph 3. The sentence stating "the kit fox may experience some loss for the same reason", should be deleted since there has been no documented evidence to support the statement. If the statement were valid, then this Department would be opposed to the use of 1080 grain baits anywhere in Camp Roberts and Fort Hunter Liggett.

Noted 21 Page 198, paragraph 3. Comments state that a squirrel reduction would allow the range to improve in over-utilized areas without reducing cattle allotments. Our experience has been that any increase in forage has led to an increase in grazing with the same over-utilized end result.

1. Agree with statement.

3. Following the proposed application of 1080, further treatment every 2 or 3 years may be necessary. However, based upon information obtained from the present Fort Ord Complex grazing studies and the current Enviromental Protection Agency and other studies on ground squirrel control, other methods such as management and/or use of other methods including toxicants may be more appropriate at that time.

9. The authors of the report did not consider the differences as significant.

20. There are sufficient data to suggest that the possibility can not be totally ruled out.

DEPARTMENT OF AGRICULTURE

COUNTY OF SAN LUIS OBISPO · P. O. BOX 637, SAN LUIS OBISPO, CALIFORNIA 93406
County Airport · Edna Road Telephone AC/805 543-1550, Ext. 254

March 21, 1977

Colonel Charles L. McNeill, CE
Office of the Director of Facilities Engineering
Ford Ord, Ca. 93941

21 Mar 77

Dear Colonel McNeill:

Changed 1 This is San Luis Obispo County's response to the draft environmental statement on Ground Squirrel Control, Ford Ord Complex. •Referrals to the Agricultural Commissioner furnishing rodenticides should be removed as they would apply to San Luis Obispo County. We have neither the budget nor the manpower to prepare the amount of baits needed for ground squirrel control at Camp Roberts or other parts of the Fort Ord complex. I would suggest you contact Kings County, they may be capable of preparing bait for you. On Page 144, third paragraph indicates that the supervision will be by officials authorized by the Agricultural Commissioner. Our offer, which still stands, is for advisory capacity only.

Noted 2 I would like to reiterate my statement made at the hearing on February 24th. in King City that of all the available rodenticides and techniques at this time, ground squirrel control by aircraft with 1080 baits is the safest, most effective and most economical.

Changed 3 It would be my recommendation that 1080 by air be the major method of controlling ground squirrels in the Fort Ord complex and that this also be used in the areas of human activity with some sensitive areas, such as buildings and open water, to be treated by hand. That references to continual baiting after aerial application as shown in the second paragraph of Page 146 should be deleted and that, if adequate control is not received in the initial program year, no other acute rodenticides should be used until adequate acceptance trials have been run and bait accepted by the squirrels to a degree that would effect adequate control. It has been our experience that we may have to wait two to three years prior to using an acute rodenticide when toxic shyness is evident.

Noted 4 There are several references to staying one mile from any active San Joaquin kit fox den with 1080 bait and a substitute of zinc phosphide for control in that area. There has been no evidence presented that there is a hazard to kit fox from field ground squirrel control baiting techniques. Our work over the years has verified that 1080 when properly applied has no threat to the San Joaquin kit fox population.

In closing I would like to urge a speedy solution to the ground squirrel program at Camp Roberts for the protection of the agricultural interests which are suffering an increasingly severe depredation from escalating ground squirrel numbers.

Very truly yours,

Earl R. Kalar

Earl R. Kalar
Agricultural Commissioner

ERK:jj
cc: Howard Mankins
Dick Nutter
Rex Marsh
Dick Dana

UNIVERSITY OF CALIFORNIA, BERKELEY

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Wildlife-Fisheries
COLLEGE OF NATURAL RESOURCES
DEPARTMENT OF FORESTRY AND CONSERVATION
DEPARTMENT OF FORESTRY AND RESOURCE MANAGEMENT
and MUSEUM OF VERTEBRATE ZOOLOGY,

BERKELEY, CALIFORNIA 94720

6 March 1977

Major General Robert L. Kirwan,
U. S. Army, Fort Ord

Subject: DEIS, Ground squirrel control, 1 February 1977

As a second generation native Californian and 30-year wildlife ecologist, I agree that control of rodents near human habitations and planted crops is desirable. But I see no justification for the use of Compound 1080 anywhere, especially by aerial broadcast on open range. Disappointingly, the DEIS emphasizes killing of native squirrels rather than reducing damage related to squirrel activities. Overabundance of rodents at present may be largely due to poor land management in the past. In addition, actual and potential beneficial effects of rodents, especially in improving the soil, are largely ignored (except for value as prey for predators), and the considerable esthetic value of enlivening naked ground with sprightly animals is unrecognized.

From the outset, the report is biased against the squirrels, which are sometimes considered "animal weeds" as they flourish on neglected land. To support the damage thesis, the writers select tidbits from work elsewhere, including some far-fetched allusions, without statement of other influences. Such advocacy reporting is not scientific investigation.

In addition, actual data on squirrels living in the problem areas are meagre. The military reservations seem to be ideal sites for applied scientific observations and experiments concerning the rodent problem, especially the ecological factors that influence dispersal.

Therefore, I suggest restriction of poisoning to minimal high risk areas, without use of compound 1080, and compilation of hard data on populations and behavior of squirrels and related widlife, and measurement of range and soil conditions.

Herewith are more specific comments elicited by a scanning of the DEIS.

Carl B Koford
Carl B. Koford

Commander USNR (Ret.)
Research Associate MVZ
Assoc. Research Zoologist, DFC

Enclosure: 1, 3 pp.

Comments on Draft Environmental Impact Statement, Ground Squirrel Control. For Ord Complex. Feb. 1, 1977. By Carl B. Koford, Research Associate, Museum of Vertebrate Zoology, Univ. Calif., Berkeley. 4 March 1977.

Qualifications: Ph. D., U C, Zoology 1950. Dissertation and book on California Condor (Koford 1953). Field work on ground squirrels at Hastings Reservation, 1938 and 1950. Author of Prairie Dogs, Whitefaces, and Blue Grama, Wildlife Monographs No. 3, 1958. Continuous interest in ground squirrels, raptors, and carnivores.

Noted 1 p. ix. Compete only for immediate food supply, such as Erodium, but in long run remove nothing from the land (ecosystem) and may help to improve soil conditions (Koford 1958; Grinnell, The burrowing rodents of Calif. as agents in soil formation, Jour. Mammalogy 4: 137 - 149. Like Darwin's earthworms? "Claimed to reinfest" - evidently no evidence for that site, and obviously account already biased against our native squirrels. Probably ecologically appropriate agricultural practices and predation would be most effective in reducing damage when the squirrels are dispersing from natal colony.

2 p. x. Destruction of squirrels on open range of HLMR would tend to help deer only if you planned to let brush cover increase; deer are mainly browsers. I suggest inclusion of non-government observers to substantiate methods used, pre-baiting surveys, and post-treatment observations of effects on squrrels and non-target species.

Noted 3 p. xi "major beneficial impact" in reduction threat plague. Statement too strong, I think, for open range squirrels. Field mice near buildings perhaps more threatening; in closer contact with humans (and cats, dogs).

4 p. 3. center. Citation of De Vos seems inappropriate for first hand information; rarely in California; if generally true, your experts should substantiate.

Noted 5 p.35. Soil displacement not ecologically a"damage"but a benefit to soil formation. para. 3. Dispersal into surrounding areas involved seems poorly documented. Sex and age of dispersing rodents? Kind of ground favored for burrowing?

6 p. 38. What are observations of time of aestivation on the specific areas involved? What are the locally relevant data?

7 p. 39. Squirrels are concentrated in patches, so aerial application will hit much non-squirrel area, and needlessly expose non-target species to poison.

8 p. 40 - 41. Burrow counts show evidence of past occupation but are of little value for determination of actual numbers and population trends. Prairie dog colonies with hundreds of holes may be "ghost towns" with few animals. Apparently areas for counted were selected for their high density, not as a random sample of an area.

9 p. 47. Raptorial birds. What was evidence from food remains at nests of eagles and hawks? Resident raptors may be important in reducing squirrel population before young are born (Craigheads 1956), when poisons ineffective.
A thorough study of squirrel population ecology on the ground should reveal ways to alleviate potential damage. The focus should be on preventing damage, not on killing native wildlife. Obviously the present methods of land management have made conditions ideal for squirrels, and routine maintenance, including removal of offending rodents, has been inadequate.

Noted 10 p. 49. Overemphasis on damage. Does our army really depend on installations that can be put out of action by a few rodents? Inspection and local remedy could have prevented most alleged damage by squirrels.

11 p. 50. Movement to an area does not assure that the animals will establish a new colony at the site visited. Dispersing animals are highly vulnerable to predators, weather, and other harm. What are the ecological factors that favor dispersal and formation of new colonies?

12 p. 61. para 2 and 3. The vegetation cut by squirrels is not lost but is recycled into soil fertility. It seems questionable to cite references of over 50 years ago (1918) when objectivity, quantified methods, and ecological understanding were poorly developed.
last para. Noxious weeds. Squirrels probably reduce occurrence of some noxious weeds, especially through cutting down before maturation of seeds and consumption of seedlings (examples in Koford 1958, prairie dogs).

Noted

13 p. 83. Mulch is important. Plant cutting by ground squirrels increases it.

Has anyone demonstrated a long-term improvement in weight gains of cattle on pasture with and without squirrels? (Short term would reflect growth spurt by plants made vigorous by rodent pruning and fertilization.)

14 p. 124. Koford 1953. Opinion based only on 1948 NRC report on 1080 tests and assumed that only the flesh of poisoned squirrels was consumed. Birds consuming whole carcasses (e.g. kangaroo rats with cheek pouches full of 1080 grain) could well be harmed. Long-term damage to carnivorous birds, including effects on reproduction and survival of condors and turkey vultures, has not been investigated. (Nor effects on humans; Dr. Joshua Lederberg, Newsweek, 7 March 1977, p. 11).

Noted

15 p. 125. Atzert 1971 also mentioned damage by 1080 to testicular tubules, but did not specify details or source of information.

Noted

16 p. 134. Yes; trap, shoot (excellent infantry traing), block burrows - all should help if used as routine maintenance. If social behavior better known, selective removal could have social effects that tend to reduce densities and perhaps dispersal.

Noted

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17 p. 138. Why omit the effects of native predators? These may reduce dense populations of squirrels if latter are made more vulnerable, perhaps by enhancing predator cover. Errington (1946) specifically excepted specialized predators that could take prey regularly regardless of its density (e.g. weasel). Also, I think that his theories apply to large areas; local populations could be reduced much more than the average for a large area. Are there alternate prey that normally become scarce at the time when squirrels are abundant or vulnerable, so that a high predator population is maintained to shift to ~~shift to~~ squirrels during a critical period? Eagles nest early in the year and could be especially effective in taking animals before young are independent of their mothers. Dispersing animals are highly vulnerable to predators. Lack of squirrels in much of your area could very well be the result of predation (is there contrary evidence?). Under primitive conditions, native prey and predators are adapted to each other, but conditions on your ranges are highly modified. These reservations would be excellent sites for predator prey investigations.

Changed, Page 152

18 p. 140. Table lacks enhancement of native predators, and increasing cover for predators, as means of control.

19 p. 144. I suggest that squirrel counts be made on sample plots before and after treatment, including counts in some unpoisoned areas. Not just burrows or carcasses on surface. Also pre- and post-poison surveys of non-target populations. What provision will be made for determining the actual area of fall of grain? Non-government impartial observers should be included in these surveys.

Page 155

20 p. 144-5. HLMR - only 4 475 A to be treated, at cost $14,370, so cost per acre is $3.21 as I figure it, not .16.

21 p. 145. "post-treatment" "retrieval of squirrel carcasses" - what about retrieval of non-target animals at various intervals ? Filling of burrows after poisoning may "pay off" in reducing re-invasion of old holes, and should make rodents more vulnerable to predators.

Noted 22 p. 153, para. 1. Also - parts of carcass consumed (stomach and contents? cheek pouches?).

23 p. 154. Didn't Calif. F & G more recently determine that the yellow color was ineffective for most seed-eating birds? What does Griffith say?

24 p. 156, last para. The lack of reported non-target deaths from 1080 is poor evidence that they do not occur. The tests are costly and include shipment to Denver lab. of USFWS. The Calif. Dept. of Fish and Game does not claim to be able to make such tests reliably (Griffith, Bischoff). Similar lack of evidence could be cited for DDT and an abundance of food additives that are now prohibited.
para. 2. But squirrels could be an essential food for some predators during a period when other food is short. (In central Idaho, mountain lions depend largely on Columbian ground squirrels in summer, according to Dr. M. Hornocker). Badgers, weasels, and perhaps snakes, can probably take squirrels year around; your word "cannot" seems unjustified.

Noted

25 p. 156 - 157. A fine list of questions, but what are the answers for the area in question? Effects largely unknown.

26 p. 158. I have examined the reports of Swick and Griffith and find that there was only cursory search for immediate deaths above ground; far from convincing evidence of lack of 1080 effects on wildlife including kit foxes.

Noted

27 p. 160, para 2. But no determination of latent effects. (There was a heavy kill of rabbits in 1946, when I was in the field in Kern Co. with J. Keyes.)
para. 3. Effects on vultures. Assumes eat only flesh containing average lethal dose. No data on sublethal or latent effects. Vultures and condors carry swallowed food to young in nests, and the young could be more susceptible to effects, including possible effects on fertility after maturation. Many think that turkey vultures in Calif. have decreased greatly in central California since 1946. Effects of 1080 on survival and reproduction of vultures are still unknown.

Noted

28 p. 161. Mere presence of S. J. Kit Fox does not prove that 1080 has not affected them. They could be locally extinguished and repopulate an area through dispersal from unpoisoned lands. The turnover of animals on an area is large (Morell 1970).

Noted

29 p. 178, para. 3. 6 425 A treated for $20,610 = $ 3.20 per acre, the same cost as for 1080.

Years ago, David E. Davis (Dept. Zoology, N. Carol. Univ., Raleigh, a leading expert on rodent population ecology and control, pointed out that the highest rate of kill may not be the most economical. The unit cost increases as the percentage kill increases, and reduction of density stimulates the reproductive and survival rates of the squirrels. The most economical percentage may be about 50, though field studies are needed to determine the optimum value. Lower rate of application would presumably be less harmful to desirable wildlife, and might leave no more survivors (than higher dose) the next spring.
I think that some of the papers of Davis, Stokes, Emlen on rat populations in Baltimore (Q. Rev. Biol. 1953), and papers of Davis, Bronson, Snyder, and Christian on woodchuck populations of Letterkenny Army Ordnance Depot in Pennsylvania, would be relevant to the current rodent problem.

Noted

30 p. 178, Alternative 2, without 1080, accompanied by ecological study, with special attention to ecological means of alleviating potential damage, seems the best measure for the current situation. The most undesirable and questionable suggestion is the use of compound 1080, especially by aerial broadcast on open range.

Noted

31 p. 209 - Lit cited. Include references mentioned in foregoing comments. Holdenreid et al. 1971, cited on p. 38, is not listed in Lit. Cited.

Changed

CBK

CBKoford, UCB
4 March 1977

3. The Army has emphasized the danger on the open range to troops in training. Field mice, *Microtus*, although they may be reservoirs of plague, are not considered of direct importance in its transmission to man.

4. Also see reference - W. M. Longhurst, 1957. A history of squirrel burrow gully formation in relation to grazing.

6. Local factors influencing aestivation are not known.

7. In aerial treatment for ground squirrel control, the pilot releases a short burst of bait on the squirrel colony or within foraging distance of that colony.

8. Burrow counts do indicate that the squirrels have been present but such counts may or may not be evidence of actual numbers of squirrels. It is recognized that burrow counts are poor indicators of squirrel numbers however, in the absence of other measurements of the population, such counts are of value in determining occupied habitat, general distribution of colonies and are an indication of the past (if not present) carrying capacity.

9. Predators are discussed on page 177. A proven and practical way of reducing the ground squirrels and associated health threat without killing the squirrels is yet unknown.

11. Ground squirrels may move from densely populated areas on public lands where less effective ground squirrel control programs are being used, to sparsely-populated, private lands where vigorous control programs have reduced the population.

13. Grinnell and Dixon (1918), Fitch and Bentley (1949), Fitch (1947 and 1948), Wagnon et.al. (1942), Bentley and Talbot (1951), and Wagnon and Bentley (1959) are some studies done on the impact of the ground squirrel on cattle and their forage. The value or benefit of ground squirrels is discussed on page 41.

17. There are no known references or data to show how the habitat can artificially be altered to enhance predators which would in turn reduce ground squirrel populations to acceptable levels. Predator populations are present on the Fort Ord Complex, yet there is little evidence that they have any significant impact on the squirrel population.

20. The cost per acre flown is $.16, not per acre treated.

21. We are recommending a pre- and post-treatment census of non-target species.

23. The yellow color of the grain acts as a deterrent to seed-eating birds if the food pressures are not intense. In areas where food pressures are high, color effectiveness is minimized. Secondly, modifying the shape of the grain (crimped oat groats) serves as an additional deterrent to seed-eating birds because they are not conditioned to eat grains which have been modified in shape. Finally, a pre-baiting program using clean (untreated) grain is recommended before actual treatment is attempted to determine if ground squirrels will readily accept the grain. This will minimize hazards to seed-eating birds, which may result from poor bait acceptance by ground squirrels.

23. It is obvious that more data are needed. We are recommending a surveillance, monitoring and testing program.

CF: Soc Dist
18 Mar

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COLLEGE OF NATURAL RESOURCES
DEPARTMENT OF FORESTRY AND CONSERVATION
DEPARTMENT OF FORESTRY AND RESOURCE MANAGEMENT

BERKELEY, CALIFORNIA 94720

March 4, 1977

Colonel Charles L. McNeill
Department of the Army
7th Infantry Div. and Fort Ord
Fort Ord, California 93941

Re: Proposal to poison ground squirrels on DOD installations

Dear Colonel McNeill:

In 1963 Secretary of Interior Stewart Udall asked me to chair his Advisory Board on Wildlife Management and he gave the board several specific assignments, one of which was to appraise the on-going program of predator and rodent control being conducted by the federal government. I enclose herewith a copy of the report transmitted to the Secretary on March 9, 1964. As you will see, the report expressed concern about careless use of highly toxic chemicals such as 1080 in controlling pest rodent populations, and it suggested some specific safeguards and controls.

Subsequently in 1971 another Advisory Committee was appointed by Secretary of Interior Rogers Morton and the Council for Environmental Quality to re-appraise the same problem which had been only partially corrected after the 1964 report. The "Cain Report" entitled Predator Control - 1971 was filed in 1972 with even more specific suggestions for elimination of the use of toxic animal poisons, particularly 1080, for the control of predators and for any purpose on federal lands. I served also as a member of that committee. The presidential ban on use of 1080 on federal lands was a direct response to the urgency expressed in the Cain Report.

1 Noted — It comes as a distinct shock to me, therefore, to learn that the Department of the Army proposes to resume use of this most toxic and dangerous chemical at Fort Ord, Fort Hunter Liggett, and possibly at other military installations in the west. There are many safe and effective ways to control populations of ground squirrels and other pest rodents without the necessity of using so crude and powerful a tool as 1080. In the first place, if these areas were lightly grazed by livestock, instead of being severely overgrazed as at present, the squirrel population would be much reduced without use of any toxicant. But to hasten the job and achieve local population control as needed, the use of anti-coagulants such as "Warfarin" derivatives is perfectly effective without endangering other animals in the ecosystem.

I urge you to desist from the use of 1080 on military lands and to seek other ways in which to manipulate vegetation and ground squirrel populations.

Surely the alleged damages and dangers posed by ground squirrels are not so acute as to demand a crash poison program such as currently proposed. Moreover, I request that this letter be entered in the record as a comment on the EIS and on the poisoning proposal.

Sincerely,

A. Starker Leopold
A. Starker Leopold

ASL:na

encl.

Siskiyou County
DEPARTMENT OF AGRICULTURE

JESS R. GRISHAM
AGRICULTURAL COMMISSIONER AND
SEALER OF WEIGHTS AND MEASURES

MAIN OFFICE — 842-3531, EXT. 80-81
BRANCH OFFICE · TULELAKE 667-5310

525 SO. FOOTHILL DRIVE
YREKA, CALIFORNIA 96097

March 18, 1977

Office of the Director of
Facilities Engineering
Department of the Army
HQ 7th Inv. Div.
Fort Ord, California 93941

Gentlemen:

This letter is in reply to your draft Environmental Impact Statement for Ground Squirrel Control at the Fort Ord Complex, Monterey and San Luis Obispo counties.

We would like to be on record in support of your proposed use of 1080. Our past experience of 30 years which includes working with the California Ground Squirrel, Spermophilus beecheyi beecheyi, the Douglas Ground Squirrel, S. b. douglasi, and the Oregon Ground Squirrel, S. beldingi oregonus, would indicate that 1080 is not only the proper, but the only choice to make.

Noted 1 From our experience, we do not believe that the 60% control you indicate can be obtained with the use of Zinc Phosphide treated bait. With Zinc Phosphide there will also be more bait left on the ground where it could endanger non-target species.

We feel the use of Zinc Phosphide in remote areas and applied by air would be a gross mistake because of the poor (even if 60% control was obtained) control and additional hazard to non-target species.

2 On page 38 of your statement you have commented upon the aestivation dates of squirrels in Siskiyou

Changed, Page 45 2 County as being in August. We would like to comment that there are two species of ground squirrels in Siskiyou County, and that the one you are referring to is the Douglas Ground Squirrel, S. b. douglasi and as in the California Ground Squirrel, the young do not all aestivate and/or hibernate and they can be seen on sunny days throughout the year. The Oregon Ground Squirrel aestivates around the end of July and goes directly into hibernation; no squirrels will be seen above ground during this time.

Changed, Page 173 3 We are concerned about the statement on page 156, paragraph 3, line 8. We cannot visualize any secondary hazard from the proper use of 1080 for gopher control.

Other than the above comments, we believe this to be a good statement of facts and principles of sound ground squirrel control as practiced in California.

We would appreciate a copy of the final report for our reference library.

Sincerely,

JESS R. GRISHAM
AGRICULTURAL COMMISSIONER

Donald H Shaw

By: Donald H. Shaw
Assist Agri. Comm.

DHS:eb

AGRICULTURAL EXTENSION
UNIVERSITY OF CALIFORNIA

DAVIS, CALIFORNIA 95616

REPLY TO: EXTENSION WILDLIFE & SEA GRANT
554 Hutchison Hall

March 16, 1977

Colonel Charles L. McNeill
Director, Facilities Engineering
Department of the Army
Fort Ord, California 93941

DRA 18 Mar 77

Dear Colonel McNeill:

Attached are my comments on the Draft Environmental Impact Statement relative to ground squirrel control on the Fort Ord Complex. I hope that they are useful to you.

Sincerely,

Dale A. Wade

Dale A. Wade, Ph.D.
Extension Wildlife Specialist
Animal Damage Control

DAW:plj

CO-OPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS, U. S. Department of Agriculture and University of California co-operating

AGRICULTURAL EXTENSION
UNIVERSITY OF CALIFORNIA

DAVIS, CALIFORNIA 95616

REPLY TO: EXTENSION WILDLIFE & SEA GRANT
554 Hutchison Hall

March 16, 1977

TO: Colonel Charles L. McNeill
Director, Facilities Engineering
Department of the Army
Fort Ord, California 93941

FROM: Dale A. Wade
Dale A. Wade, Ph.D.
Extension Wildlife Specialist
Animal Damage Control

RE: Comments on the Draft Environmental Impact Statement, Ground Squirrel Control, Fort Ord Complex, California

Changed 1 Page ix, paragraph 4, line 2: . . . "1080 (a secondary poison)". . . might be more accurately expressed as "1080 (a poison which has potential secondary hazards)."

Changed 2 Page x, paragraph 2, lines 6-8: Incomplete sentence. ". . . since the range may be improved." (Line 8), does not express by what factor or how the range may be improved.

Changed 3 Page xi, paragraph 3, line 4: Is there assurance that carnivores <u>will</u> be affected or <u>may</u> they be affected?

Changed 4 paragraph 4, line 1: Is there assurance that these animals <u>will</u> be affected or <u>may</u> they be affected?

Noted 5 paragraph 4, lines 8-10: Ground squirrels are relatively unavailable as prey food base during aestivation and hibernation but would be available during other months of the year.

Changed 6 Page 14, paragraph 6, lines 3-5: It is not clear what intermingles between the 180 and 400 foot aquifers.

Changed 7 Page 64: The term "blocked", in reference to infected fleas, is not defined here or in the glossary.

8 Page 77, paragraph 1, lines 12-13: If the potential for human plague is significantly related to high ground squirrel populations as indicated in this draft EIS and there is a need for reduction of ground squirrel populations to aid in reducing the potential

CO-OPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS, U. S. Department of Agriculture and University of California co-operating

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8 hazard, the position statement that, "The work of the Public Health Department is made easier if ground squirrels are not poisoned.", seems inappropriate. Further (page 77, paragraph 3, lines 1-2), the position statement that, "The Public Health Department does not support or participate in large areawide flea and rodent control.", is not clear but suggests that insufficient importance is attached to this aspect for reducing the plague potential.

9 Page 78, paragraphs 6-9: It is indicated that DDT has been used under emergency exemption to control fleas and that carbaryl is not always effective. Thus, it is not clear why paragraph 6 states that only carbaryl is available, even though it is the only registered chemical, particularly in view of the statements made by the Director, California Department of Public Health, (paragraph 2, No. 2, page 114). (See also page 142, paragraph 2, lines 6-9).

Page 143 10 Pages 134-135: Trapping and shooting as alternate control methods are not considered practical; however, there is no information provided on the costs and manpower requirements which led to rejection of these as feasible alternatives.

Changed 11 Page 150, paragraph 4, lines 1-3: Primary poisoning includes direct ingestion by any species, and is not restricted to "nontarget species" as indicated.

Changed, Page 172 12 Page 155, paragraph 2: Pocket gophers are not significantly affected by 1080 baiting aboveground so far as is known but 1080-treated grain has been used to reduce their numbers by underground baiting, (see also page 156, paragraph 3, lines 8-9).

Changed 13 Page 156, paragraph 3, lines 8-9: It is stated that the only time secondary hazards exist "is in pocket gopher control". This is inaccurate.

Noted 14 Pages 191, 197 and 201-202: The summaries on these pages relative to Environmental Impact and Maintenance and Enhancement of Long-Term Productivity appear to conflict to some extent. It is pointed out that benefits of the proposed actions to reduce ground squirrel populations include reduction of plague hazards, damage to military structures, crop damage and competition with livestock; and these appear to be logical consequences of the proposed actions.

However, on page 191 it is indicated that there is no adverse environmental impact on open range areas from Alternative 3 (no action) except for safety, economics and land use. Based on damage levels reported to crop and livestock production no action would seem to present significant adverse impacts on energy used in such production. That is, significant amounts of energy are expended to such production and to ground squirrel damage control.

> If crop and livestock production is lost, the energy involved in such production is wasted. Moreover, greater energy expenditures will be necessary on both private and military lands to deal with such damage, particularly if mechanical methods are required.

Thus, it appears that the adverse impact of inefficient ground squirrel control, or no action, on fossil energy expenditures may not be sufficiently considered in this draft EIS.

With regard to human plague, the potential for a pneumonic plague epizootic developing from the Fort Ord Complex may also be insufficiently addressed.

DAW:pj

8. Full agreement on the most suitable course of action does not exist even among Public Health officials.

9. Carbaryl applied now before plague positive fleas are found may preclude the need to initiate DDT measures which have been considered to have adverse effects. Carbaryl has been further tested and the causes of its earlier uncertain action have been identified. See page 151.

LETTERS OF COMMENT FROM ORGANIZATIONS:

COMMENTS OF THE NATIONAL AUDUBON SOCIETY
ON THE DEPARTMENT OF THE ARMY's
DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
ON GROUND SQUIRREL CONTROL,
FORT ORD COMPLEX, CALIFORNIA

MARCH 21, 1977

National Audubon Society
950 Third Avenue
New York, New York 10022

INTRODUCTION

The Department of the Army's Draft Environmental Impact Statement (DEIS) on Ground Squirrel Control, Fort Ord Complex, California, describes a proposal to use sodium monofluoroacetate (1080) to control California ground squirrels (Spermophilus beecheyi) on three federal military installations in California. The need for this control arises from high ground squirrel populations on these areas allegedly creating human health hazards, crop and range depredations, and damage to military structures.

1 By Executive Order, the field use of chemical toxicants to control animals is prohibited on federal lands except where an emergency exists which cannot be dealt with by other means. 2 The Surgeon General has determined that the ground squirrel populations on the Fort Ord Complex constitute a potential reservoir of plague and, therefore, that a significant threat to human health exists which qualifies for an emergency exemption from the Executive Order for the proposed use of 1080.

3 Changed It is unclear from the DEIS whether the major federal action regarded as requiring the preparation of an environmental impact statement under Section 102 (C) of the National Environmental Policy Act is the proposed ground squirrel control program itself, or the application for exemption from the Executive Order for the use of 1080 on federal lands in that program.

OBJECTIVES

As stated in the DEIS,

> The objective of the proposed action is to reduce ground squirrels and their fleas to acceptable levels which in turn will reduce 1) the human health hazards, 2) crop and range depredations, 3) damage to military structures and interference with military activities. (p. 143; See also p. ix)

JUSTIFICATION

The damages to military structures and facilities by ground squirrels identified in the DEIS are related to their burrowing and gnawing activities and include: damages to an airstrip apron, radar station mounds, earthen dams, ammunition bunkers, road banks and surfaces, footpaths and sidewalks, concrete foundations, the wiring and mechanisms of automated rifle firing ranges, underground wiring next to an airstrip, wiring at a sewage treatment plant, recreational playing fields, and the out-buildings, adobe and stone wall, grinding mill and aqueducts on the San Antonio Mission grounds. (pp. 3, 42-49) These damages are estimated at approximately $300,000, with annual costs of some $5,500. (p. 49)

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The DEIS states that:

> These ground squirrels . . . damage crops on adjacent private lands, and compete with other wildlife and with domestic stock for food. (p. ix)
>
> Their foraging activities on grazed lands, as with livestock, often leads to an alteration of plant species and density of cover which enables them to become more abundant and to compete even more with livestock for forage. (p. 3)
>
> The grazed rangeland (grassland and oak woodland) of Forts Ord, Hunter Liggett and Camp Roberts are prime habitat for ground squirrels . . . Wherever large populations of ground squirrels occur on these rangelands the potential for damage to vegetation and competition between these rodents and livestock exists. (p. 61)
>
> Competition is most severe in fall, winter and early spring . . . [but] in dry years competition may be extreme throughout the livestock grazing season. (p. 61)

4 The DEIS does not document the extent of these crop and range damages, but states that:

> . . . squirrels from the military lands are claimed to reinfest the treated private lands, causing crop damage and rendering the ground squirrel program on private lands ineffective. (p. ix; See also p. 50)
>
> Field observations . . . did not substantiate reported damage to adjacent crops or pasture because of the time of year (November). (p. 50)

and cites a 1953 S.C.S. soil and range survey report which noted that at Fort Hunter Liggett,

> *One of the most damaging factors found on the range was the teeming population of squirrels.* The squirrels have denuded quite a few acres and unless checked, will harm more acres and lessen production of forage on the entire range. (p. 81)

5 The November 8-19, 1976, field observations by Jones & Stokes Associates, Inc. included "several observations concerning range appearance" (p. 85), but the DEIS does not indicate that range damage by ground squirrels was identified as a problem.

Although the DEIS devotes considerable discussion to these reported and claimed problems of damage to military structures and depredations of crops and range (pp. x, 3, 5, 42-63, 143, 188), it notes that:

> The policy of the Vector Control Section of the California Department of Health toward control of ground squirrels is as follows: ground squirrel control is not supported on lands where proposed reasons for control are based upon actual or threatened crop damage or grazing competition with livestock. This is an agricultural problem to be

> handled through decisions made by agricultural officials. Likewise, control of ground squirrels that cause structural damage to levees, earthen dams, bunkers, etc. is a decision to be made by persons involved in maintenance of these structures. (p. 76)

and

> The Army position with respect to control measures is that a threat to human health is the only reason to use toxicants having secondary effects. (p. 110)

THE EXECUTIVE ORDER

Executive Order 11870, issued July 18, 1975, revised the previous Environmental Safeguards on Activities for Animal Damage Control on Federal Lands issued February 9, 1972, and prohibits the field use on federal lands of chemical toxicants for killing predators, and of chemical toxicants causing secondary poisoning for killing mammals, birds or reptiles, except

> . . . the head of any agency may authorize the emergency use on Federal lands under his jurisdiction of a chemical toxicant for the purpose of killing other mammals, birds, or reptiles, but only if in each specific case he makes a written finding, following consultation with the Secretaries of the Interior, Agriculture, and Health, Education and Welfare, and the administrator of the Environmental Protection Agency, that an emergency exists that cannot be dealt with by means which do not involve use of chemical toxicants, and that such use is essential. (p. 95)

The Executive Order is explicit in limiting this "emergency use" exemption to "specific case[s]" where "an emergency exists" and "such use is essential" to protect human life, endangered species or nationally significant natural resources. (p. 4, 95)

No claim is made in the DEIS that the use of 1080 is necessary to protect endangered species or nationally significant natural resources. To meet the requirements for an emergency use exemption, therefore, the Army must demonstrate 1) that a specific human health emergency exists, 2) that the existing emergency cannot be dealt with by any other means, and 3) that the use of 1080 is essential to protect human life.

THE PLAGUE THREAT

Under both the Executive Order (pp. 4, 95) and Army policy (p. 110), the proposed ground squirrel control program using 1080 may be implemented only if conditions constituting an emergency human health threat are demonstrated to exist. Accordingly,

> The Surgeon General has determined that this large ground squirrel population at the Fort Ord military complex (Fort Ord, Fort Hunter Liggett and Camp Roberts) represents a significant public health threat. (p. 109; See also pp. 5, 96, 192)

and that,

> . . . a threat to health from plague definitely exists at Fort Ord, Fort Hunter Liggett and Camp Roberts, California. (p. 110)

The Rationale

The "rationale for the Army Surgeon General's determination that a threat to human health exists" (p. 96) is based upon the following circumstances:

1. A highly abundant, susceptible host species overrunning the areas in which people live, train, work and play.
2. High flea counts on the rodent hosts.
3. A marked increase this year in the occurrence of epizootic plague and human cases throughout the western states, including California.
4. Evidence by carnivore serology of the existence, right now, of plague foci at the Fort Ord complex or in the vicinity. (p. 74; See also p. 96)

The "rationale" of the Surgeon General's determination may be more fully outlined as follows:

> Enzootic plague occurs in small rodents in the area (pp. 64-65), as has been demonstrated by serological studies in carnivores (pp. 72, 73-Table 8, 112-113).
>
> High populations of highly susceptible ground squirrels (pp. 40-43, 72, 74) with high flea counts (pp. 67, 68-Table 7, 70-Figure 30, 71-Figure 31, 72, 74, 96) occur on the Fort Ord complex and constitute a "large potential reservoir of sylvatic (bubonic) plague" (p. ix).
>
> Bubonic plague is transmitted to man by the bites of fleas which have become infected by feeding on infected rodents (p. 64).
>
> It is "inevitable that [plague] at some time in the future will enter into the highly susceptible ground squirrel population" (pp. 5, 115).
>
> The ensuing epizootic will decimate the ground squirrels (pp. 72-74), causing large numbers of infective fleas to seek alternate hosts (pp 64, 168), including humans (pp. 3, 65, 77, 114).
>
> An increase in the occurrence of rodent and human plague has been reported throughout the western states, including California, in 1976 (pp. 74, 96).
>
> Therefore, a significant public health threat from plague exists at the Fort Ord complex (pp. 109-110).

The Specter of Plague

For many, the mention of plague immediately conjurs up visions of the great pandemic of 542 A.D. during the reign of the Emperor Justinian, and the "Black Death" which ravaged Europe during the Middle Ages, killing 25 million people in the "great mortality" of the fourteenth century, killed 70,000 people in London in 1665, and resulted in more than 10 million deaths in India from 1896 to 1918. (Burrows)

The epidemiologic aspects of these classic plague epidemics is described by Meyer:

> Essential for development of bubonic plague in man is the primary rat-flea-rat transmission cycle. The flea becomes infected from the blood of a sick rat, which in the terminal bacteremia may contain 10^7 bacilli per cu.mm. of blood. These bacilli multiply in the midgut of the flea, and massive infection develops in the proventriculus, blocking the pharynx and the esophagus. When the flea attempts to take its next blood meal, from 25,000 to 100,000 bacilli are regurgitated via the insect's proboscis into the skin or the capillaries of the new mammalian host.

According to Miller,

> In so far as human plague is concerned, domestic rats (Rattus rattus and R. norvegicus) are the most important animal hosts . . .
>
> . . . most cases of human plague arise in urban areas and in the wake of rat epizootics. Under circumstances of poor sanitation, a concentration of people and of rats provides an opportunity for the transmigration of fleas from rats to man. . .
>
> The flea is the usual transmitting agent. In murine and human infections the most important species is the Oriental rat flea, Xenopsylla cheopis . . . Oriental rat fleas will accept other hosts, including man, particularly if rats are not immediately available. When an epizootic decimates the rat population, fleas are encouraged to transfer from the dead hosts to humans. . .
>
> Direct transmission of the bubonic form from man to man is unusual, in contradistinction to the mode of spread of primary pneumonic plague. The latter type of epidemic is initiated by a patient with bubonic disease who develops a secondary plague pneumonia and thereafter excretes large quantities of organisms in his sputum. The infection may then be air-borne in droplet nuclei directly to a human contact. This type of plague is highly contagious, secondary cases are common among those attending a patient, and under suitable circumstances, tremendous outbreaks may occur.

Burrows notes that,

> . . . the rat flea of North America and Europe, Ceratophyllus fasciatus, may also transmit the disease.

. . . while infection is initially carried to man by ectoparasites of rodents, epidemic bubonic plague in man is transmitted largely from man to man by human ectoparasites, notably the human flea, Pulex irritans.

Analysis of the Threat

Although epidemic human plague has an awesome mortality potential, in evaluating the "threat to health from plague" at the Fort Ord complex, it is necessary to return to the epidemiologic "rationale" and examine the evidence upon which each component is based in terms of the current situation and modern medical knowledge.

1. Evidence of enzootic plague in rodents in the area.

The DEIS states that,

> Sylvatic (wild rodent) plague is known to exist in the western third of the United States . . . (p. 64)

and

> The chief natural reservoirs of the plague are wild rodents, which are subject to periodic epizootics throughout the world. (p. 64)

6 Of 81 small rodents other than California ground squirrels from Fort Hunter Liggett collected in 1975-1976 and tested at the Walter Reed Army Research Institute, none showed serological evidence of plague (p. 73), and

7
> The research project entitled, "Ecology and Control of Sylvatic Plague at Hunter Liggett Military Reservation," being conducted by Letterman Army Institute of Research has yielded over 1,200 rodents during the last 16 months, none of which has been found positive for plague organisms. (p. 112)

The "evidence by carnivore serology of the existence of plague foci at the Fort Ord complex or in the vicinity" (pp. 74, 96) is the demonstration of anti-plague antibody in the sera of 13 of 77 (17%) carnivores tested (p. 73).

8 It is instructive to examine the levels and incidence of plague antibody in the various carnivore species tested. For example, of 31 wild carnivore sera tested, 3 (10%) showed anti-plague activity, while 10 of the 46 (22%) domestic carnivore sera showed anti-plague antibody. It should be noted, however, that the one positive bobcat serum and three of the positive dog sera reacted only at the 1:8 dilution, a level which in the ground squirrel is considered to be negative. (p. 73-Table 8) If these low titer reactors are excluded, the evidence of plague in wild carnivores is limited to 2 of 11 (18%) coyotes, or 6 percent of the wild carnivores tested. Among domestic carnivores, 6 of 32 (18%) dogs and 1 of 14 (7%) cats, or 15 percent of those tested, would be considered positive under this criterion.

9 The DEIS makes no attempt to correlate this incidence of reactors to the "normal" incidence of anti-plague antibody in wild and domestic carnivores in other areas, and without more information on the statistical basis of the sampling, it is difficult to assess the significance of these findings. This becomes especially important when it is considered that sampling has been conducted on only one of the three installations for which it has been determined that a plague threat exists. (pp. 72-73, 112-113)

10 It is interesting to note, however, that the results would appear to suggets that "plague foci at the Fort Ord complex or in the vicinity" are at least as prevalent in the areas of human occupation as throughout the grasslands and woodlands where the wild carnivores are found. In fact, while it does not indicate the species or numbers involved, Figure 29 shows that one of the three areas at Fort Hunter Liggett where plague positive carnivores were found was the cantonment area. (p. 69)

2. Evidence of high populations of highly susceptible ground squirrels.

The DEIS notes that,

> Because many squirrels had begun hibernation when these field studies were conducted, no accurate counts of squirrels per acre could be made. However, the number of burrows per acre does represent an indication of relative abundance, assuming that 50 burrows/acre is considered to represent a "dense" ground squirrel population. (p. 42; See also p. 39)

11 Table 6 displays the results of burrow counts but suggests a selective sampling of habitats which precludes estimates of average or total populations. These burrow counts range from 7/A on open grassland at Camp Roberts and 51/A on open grassland at Fort Hunter Liggett, to 111-137/A at grassland/grain interfaces, to 329/A on the Camp Roberts baseball field. (p. 43-Table 6) These counts suggest high densities of ground squirrels in the areas sampled, but the DEIS does not indicate whether the sample areas were randomly selected within the various habitat types nor the extent of the various habitat types represented by the sample areas. The maps of the installations, for example, show only "ground squirrel damage" areas (Figures 13-15, pp. 44-46), while the pictures show only restricted examples of specific types of damage (Figures 16-27, pp. 47, 48, 51-60). Without statistically valid data, it is impossible to evaluate the extent of the ground squirrel problem or appropriate control measures.

As the DEIS notes,

> Generally the ground squirrel is highly susceptible to plague infections and the population is drastically reduced. (p. 72)

3. Evidence of high flea populations on the ground squirrels.

The DEIS reports that,

> Fort Ord and Camp Roberts were visited, but no studies were conducted.
>
> Ground squirrels at two sites on Fort Hunter Liggett. . . were trapped and released on a regular schedule for one year to determine ground squirrel population dynamics and make flea counts . . . Short-term collections of ground squirrels and other rodents were conducted in other areas, and counts were made of hosts and fleas . . . (p. 67)

Figure 30 shows the seasonal occurrence of ground squirrels at Fort Hunter Liggett, as determined by trapping rates, to rise rapidly from a low in April (5 squirrels/100 traps) to a peak in June (30/100) which plateaus until October, and then drop rapidly to another low in December (7/100). (p. 70)

Figure 31 shows the seasonal flea counts on ground squirrels at Fort Hunter Liggett. Counts of Hoplspsyllus anomalus rise from less than 5/squirrel from January to April, to a peak of over 40/squirrel in August, and then drop rapidly to less than 20/squirrel in September and October, and less than 5/squirrel in November. Counts of Diamanus montanus average about 20/squirrel from January to April, and then drop to about 10/squirrel until October when they increase again to a high of over 30/squirrel in November and December. (p. 71)

12 These data indicate that counts of H. anomalus tend to vary directly, while counts of D. montanus vary inversely, with ground squirrel occurrence. Thus, counts of H. anomalus parallel ground squirrel occurrence while counts of D. montanus decline as ground squirrels increase their above ground activity.

13 As with the serological studies, however, the DEIS does not indicate the statistical basis of the sampling, nor does it define a "high flea count"
14 or relate the counts at Fort Hunter Liggett to those on ground squirrels from areas where plague epizootics were occurring, so it is difficult for the reader to interpret the significance of the data presented. It appears, however, that the "high flea counts" may relate to the summer populations of H. anomalus and the parallel above ground occurrence of ground squirrels.

The DEIS points out that,

> No plague has been reported to date by Walter Reed Army Research Institute concerning the 31,000 fleas (pooled samples) tested (mostly taken from California ground squirrels). (p. 72)

15 4. Evidence that the ground squirrel populations on the Fort Ord complex constitute a reservoir of plague.

The DEIS states that,

> These ground squirrels constitute a large potential reservoir for sylvatic (bubonic) plague . . . (p. ix)

16 Changed It should perhaps first be noted that the terms "sylvatic" and "bubonic" are not synonymous. Sylvatic plague refers to enzootic plague in wild rodents, while bubonic plague describes the form appearing in man following the bite of an infective flea where the regional lymph nodes become a swollen, painful, suppurative mass known as a "bubo." (Miller)

A reservoir of infection is defined as "the nonclinical source of infection . . . or the passive carrier of a pathogenic organism." (Dorland)

The DEIS states, however, that,

17 It is not known for certain whether some ground squirrels infected with plague can survive and thus maintain a plague reservoir . . .

> The probable method of sylvatic plague transmission is transference of infective fleas from wild rodents, such as field mice, deer mice, etc. to ground squirrels, which then results in an epizootic. Generally the ground squirrel is highly susceptible to plague infections and the population is drastically reduced.

and recognizes that,

18 . . . ground squirrels in California are not a permanent reservoir of the plague. (p. 72)

> Persistent reservoirs of plague are not those species involved in violent epizootics, but relatively resistant species in which the disease organism is adapted. (p. 66)

19 . . . the primary reservoirs appear to be Microtus spp. and Peromyscus spp. and . . . the ground squirrel becomes infected through contact with infected populations of deer mice, meadow voles, etc. (p. 66)

20 The plague will still remain in other rodents even though the ground squirrels are all killed. (p. 74)

Miller points out,

> In the United States the endemic reservoir encompasses at least 38 species, including rats, mice, marmots, owls, gophers, badgers, rabbits, prairie dogs, squirrels and chipmunks.

Thus, while California ground squirrels may be the potential victims of plague epizootics, they cannot be regarded as a "large potential reservoir for sylvatic . . . plague." A corollary, therefore, is that eliminating the ground squirrels will have little effect on the true reservoirs of plague in the vicinity of the Fort Ord complex.

5. Evidence that bubonic plague is transmitted to man by the bites of fleas which have become infected by feeding on infected wild rodents.

It was noted above that, "Essential for development of bubonic plague in man is the primary rat-flea-rat transmission cycle." (Burrows) As Miller explains, however:

> In rural or wooded regions in many areas of the world, plague is enzootic in numerous other species of vertebrate hosts, chiefly rodents. Such infection is referred to as sylvatic plague, in contrast to rat or murine plague . . . (emphasis in original)

The DEIS states that,

> Bubonic plague is transmitted by the bite of an infective (blocked) flea, e.g., . . . Diamanus montanus (common with ground squirrels) . . . (p. 64)

According to Meyer, however:

> Only a comparatively few fleas feeding on an infected rodent with severe bacteremia become infected, and fewer still become infective. The numbers of fleas that become infective are conditioned by species, feeding habits, whether zoophilic (as are many wild rodent fleas) or anthropophilic, and the efficiency as a transmitter, which varies with species and is greatly influenced by climate . . .

21 . . . the plague vector efficiency of wild rodent fleas has been compared with that of Xenopsylla cheopis, and none approached the high efficiency of this species. The common squirrel flea (Diamanus montanus) is not very efficient. In fact, rodent fleas bite man only when they have been deprived of their usual host for some time, and as a rule attack their own hosts or other rodents rather than man. In wild rodent plague, flea transmission from rodent to man apparently represents a weak link accounting for few transmissions to man. Far more threatening is the introduction of plague by squirrel fleas into rat populations . . .

> Rural plague among hunters, workers in woods, and children [is] transmitted through rodent bites or handling, and perhaps infrequently by insect bites . . .

6. Evidence that plague inevitably will enter the high ground squirrel populations at the Fort Ord complex.

22 While plague epizootics have occurred in the area in the past (pp. 76, 115), to suggest that it is "inevitable that the disease at some time in the future will enter into the highly susceptible ground squirrel population" (p. 115) appears to substitute the logic of an infinite number of typewriters and an infinite number of monkeys for an objective, scientific examination of the current situation and existing "emergency" under which the exemption from the Executive Order is being sought.

In fact, it is instructive to note that, in quoting the June 30, 1976, letter from the Director of the California Department of Health, even the DEIS is careful to paraphrase this conclusion as follows:

> The Director . . . has concluded that "it is inevitable that [rodent-borne disease] will enter the highly susceptible ground squirrel population . . ." (p. 5)

23 And in the direct quotation from this letter on p. 76, the word "inevitable" is strangely and without explanation omitted. Apparently even the Army realizes that a plague epizootic is not "inevitable."

24 The DEIS even points out that,

> Plague occurrence has not been documented at Camp Roberts . . . (pp. 76, 115)

> Epizootics occur when infection transfers to susceptible species of relatively high density. Such epizootics may be brief and limited or may follow an ever-shifting path for years. (p. 66)

Plague epizootics may go undetected (pp. 76, 115) and "other diesases periodically reduce ground squirrel numbers" (p. 38). "Other factors undoubtedly contribute to the mortality of ground squirrels . . ." (p. 38) To suggest that ground squirrel numbers will remain high until plague intercedes to reduce their populations is to ignore the fact that plague was not recognized in the United States until 1900 (Miller) and was not observed in wild rodents in California until 1908 (Burrows).

> In October, 1899, a case was recorded at Santos, Brazil; this is thought to be the first occurrence of plague in the Western Hemisphere. (Burrows)

> However, other evidence suggests that rodent plague actually was present long before. (Miller)

In either event, to suggest that a plague epizootic inevitably will occur in the present ground squirrel populations on the Fort Ord complex is to ignore a number of important ecologic and epizootiologic factors, and the resulting sensationalism is inconsistent with scientific objectivity and professional analysis.

7. Evidence that an epizootic of plague in the ground squirrel populations at the Fort Ord complex would result in significant human exposure.

Should plague at some time enter high populations of ground squirrels at the Fort Ord complex, and should an epizootic ensue, it is probable that the populations would be drastically reduced. (p. 72) It is even possible that at the "interface between the ground squirrel and humans" in "areas such as campgrounds, recreational areas, bivouacs, some ranches, etc." "there is sufficient and frequent enough human contact with ground squirrels and their fleas to be a human health hazard" (p. 77) if such an epizootic were to occur.

However, as Miller points out:

> An epizootic of sylvatic plague in an area may involve a number of different animal species and a complex exchange of ectoparasites. Such outbreaks may be devastating to the rodent populations, yet may give rise only to sporadic human cases simply because man rarely comes into close contact with those animals.

25 And Meyer notes:

> Unless there is a considerable population of infected Rattus rattus, plague is never transmitted to man to any serious extent.

The DEIS itself recognizes that,

26 Plague in man in the United States is limited to rare instances of exposure to wild rodents and their fleas. (p. 64)

> Sporadic human cases of sylvatic origin usually are a consequence of epizootics in [ground squirrels or chipmunks]. (p. 65)

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27 The DEIS cites a World Health Organization text on plague that states:

> While . . . the danger of a spread of plague to man through direct contact with wild rodents or through their fleas is slight, secondary involvement of the rats or other rodent species living near man might greatly enhance the chances for human infection.
>
> . . . the fundamental differences between rat-caused and wild rodent plague is that the presence of the infection among the rats is apt to lead to the appearance of collective human cases in settlements, whereas wild rodent plague in the strict sense is, as a rule, responsible merely for the occurrence of sporadic cases in persons who have entered the haunts of the species concerned. (p. 67)

28 8. <u>Evidence of a marked increase in the occurrence of epizootic plague and human cases throughout the western states, including California, in 1976</u>.

The DEIS cites Walter Reed Army Institute of Research data which, it purports:

> . . . show that the overall incidence of plague cases has increased in recent years in the U. S., and suggest that the problem is a great deal broader in scope, involving other Federal lands in the West, than the immediate problem at Fort Ord. (p. 96; See also p. 74)

The only data presented in the DEIS to support this assertion (Table 9) show 8 cases of human plague in the U. S. in 1974, 22 in 1975, and 13 in 1976. (p. 75) The statistical significance of these figures is not discussed, but whether this represents an actual "marked increase" in the incidence of human plague appears somewhat subjective, especially when related to the increased popularity of outdoor activities which bring more humans into greater contact with all sylvatic plague reservoirs.

Of the 43 cases of human plague reported from 1974 to 1976, 3 occurred in California. Moreover, the data presented simply record "cases" and do not report the number of fatalities, so the real significance of the "problem" cannot be evaluated. Similarly, only the "occurrence," not the number or incidence, of rodent plague cases is reported. (p. 75-Table 9)

29 Most importantly, no attempt is made in the DEIS to relate this information to the situation at the Fort Ord complex or to other areas where control programs such as that proposed here are being carried out.

9. <u>Evidence that a significant public health threat from plague exists at the Fort Ord complex</u>.

The World Health Organization text on plague cited in the DEIS outlines the circumstances under which wild rodent plague may pose a significant human health threat:

> . . . in view of the often enormous extent of the wild rodent plague foci, the aggregate number of human infections contracted in them may be considerable, and the case-mortailty is apt to be high since the patients often receive no adequate treatment, either because they live away from centers of civilization, or because, owing to its sporadic incidence, the presence of the disease is not recognized. (p. 67)

30 The DEIS has failed to demonstrate, or even allege, that these conditions obtain on the Fort Ord complex. Rather, as demonstrated in these comments, the determination that a significant public health threat from plague exists requires the acceptance of a sequential series of assumptions, many of which are supported largely by speculation, inference and equivocal evidence. Thus, while failure of any one of the links in the chain of reasoning upon which

31 the rationale is based undermines its validity, examination of that rationale shows it to have been pieced together entirely from weak links, and the chain of reasoning is unable to support even the weight of evidence contained in the DEIS.

32 A careful reading of the DEIS reveals that plague has not been demonstrated in the true wild rodent reservoir species, and the assumption that plague foci exist in the "vicinity" of the Fort Ord complex is based on serological studies in a limited number of carnivores which have "not been extensive enough to locate these foci" (p. 113), but, in fact, suggest they may be in the contonment area at Fort Hunter Liggett rather than in the outlying areas proposed for 1080 control. No evidence of plague has been demonstrated in ground squirrels or their fleas.

While high burrow counts have been recorded in selected areas, no estimates of the actual ground squirrel populations have been made. The conclusion that high populations exist is based on selected and limited data of undemonstrated statistical validity. The ground squirrel populations do not constitute a "large potential reservoir of . . . plague."

33 The DEIS fails to provide evidence that the flea populations reported actually represent "high flea counts on the rodent hosts." The species of fleas on the ground squirrels do not readily bite humans and are very inefficient transmitters of bubonic plague.

A number of ecologic factors influence ground squirrel populations, and it is not "inevitable" that plague will occur in the present ground squirrel populations, or that an epidemic will ensue if it does.

34 If a plague epizootic were to occur among the ground squirrel populations at the Fort Ord complex, even without quarantine measures being implemented, only sporadic human cases of bubonic plague would be expected to result even among those in the vicinity of ground squirrel colonies.

35 Effective treatment is available in the event sporadic cases would occur:

> Formerly the fatality rate of bubonic plague varied from 50 to 90 per cent, while the pneumonic, septicemic, and meningitic forms were almost invariably fatal. However, even the gravest varieties of infection respond to chemotherapy if treated early enough. The overall fatality rate has been reduced to 5-10 per cent.
>
> Most fatalities occur during the first week of illness.
>
> Even pneumonic and septicemic cases can be salvaged if treatment is initiated early (within the first 20 hours after onset). (Miller)

36 In true emergency situations, vaccines are available which provide limited and transitory immunity.

> General vaccination of a population is a worthwhile procedure in an area under serious threat of an epidemic. (Miller)

Examination of the evidence, therefore, reveals that the DEIS has failed to demonstrate that a human health emergency involving plague currently exists, or even is likely to develop, at the Fort Ord Complex. The potential for such a health threat is highly speculative and is based upon a number of assumptions, each of unestablished probability. This conclusion is reflected in other comments contained in the DEIS.

The Council on Environmental Quality stated:

> It is the Council's view, however, that there is no present emergency justification for the use of 1080 or DDT to control fleas and ground squirrels in military installations in California. (p. 98)

Although it did not attempt to evaluate the rationale of the alleged plague threat, the Department of the Interior noted,

> However, there may be some question as to the immediacy of the emergency . . . (p. 100)

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37 The Department of Health, Education and Welfare commented that,

> It is our understanding from the data presented at your meeting on August 17 with Department representatives that the potential for the occurrence of bubonic plague exists at the Fort Ord military complex in California. (emphasis supplied) (p. 100)

and went on to

> . . . agree that a potential hazard to human health does exist. (emphasis supplied) (p. 100)

38 The Environmental Protection Agency agreed that the Army had demonstrated

> that an emergency health risk exists to warrant a request for an exemption from the Executive Order . . ., but it is felt that 1080 (sodium fluoroacetate) should be avoided unless other means of control are shown to be ineffective. (emphasis supplied) (p. 99)

39 That the Army itself recognizes the tenuous nature of its inference that an emergency actually exists is reflected in the wording of the Surgeon General's determination, which states only that "a threat to human health exists" (p. 96), and by the disclosure in the DEIS that,

> Even though DDT is still used in this country in emergency public health cases . . ., under present circumstances, DDT cannot be considered a viable method of flea control at the Fort Ord Complex." (p. 143)

Apparently the Army would have the reader believe that a sufficient emergency exists to justify the use of 1080, but not DDT; however, the data in the DEIS do not appear to warrant such a refined determination.

A PERPETUAL EMERGENCY

The Executive Order is explicit in providing that an exemption may be granted "only if in each specific case" the head of the federal agency "makes a written finding . . . that an emergency exists that connot be dealt with by [other] means . . . and that such use is essential." (p. 95)

Here, however, examination of the DEIS discloses that the Army really is seeking an open-ended, continuing exemption for use of 1080 on the Fort Ord complex into the indefinite future:

> Follow-up treatment with 1080-treated grain will be conducted every 2-3 years wherever squirrel populations recover or reinfestations occur. (p. 1)

> . . . persistent and intensive efforts are needed to keep the squirrel population at levels necessary to minimize conflicts. (p. 35)

> Rodenticide 1080 can be applied annually to achieve adequate results. (p. 96)

> Retreatment with aerially-applied 1080 bait may be required every 2-3 years, wherever the ground squirrel populations increase again to high density. (p. 144)

> Ninety percent mortality initially may keep the population suppressed for 2 or more years before retreatment may be necessary. Subsequent control with 1080 can be used to maintain a depressed population. (p. 151)

> To achieve long-term gains, a repeated control of the ground squirrel population may be necessary, probably every 2 to 3 years, with 1080 . . . (p. 198)

40 The Army's proposed open-ended use of 1080 not only represents a dangerous precedent for circumvention of the Executive Order on other federal lands throughout the West, but it demonstrates how the stringing together of a series of possibilities, inferences and assumptions, and the application of the 'infinite number of monkeys and typewriters' rationale, leads to the irrational hypothesis that a perpetual emergency exists at the Fort Ord complex that cannot be dealt with by any other means than the proposed 1080 control program.

Moreover, although the evidence that a plague threat exists at Fort Hunter Liggett is tenuous, at best, no investigations have been conducted which would support a determination that public health threats exist at Fort Ord and Camp Roberts. Thus, the Army's application for exemption from the Executive Order covers three installations, but the "written finding . . . that an emergency exists" is supported by data from only one "specific case."

It is evident from these disclosures that, even if the Army had demonstrated that an emergency actually does exist at Fort Hunter Liggett, its application for exemption from the Executive Order would have to be denied on the basis that the proposed indefinitely continued use of 1080 on the three

installations is improper and does not conform to the provisions under which exemption may be granted, i.e., only if 1) in each specific case, 2) the head of the federal agency makes a written finding that an emergency exists, 3) that cannot be dealt with by other means, and 4) that such use is essential to protect human life, endangered species or nationally significant natural resources. (pp. 4, 95). The Army's proposal to use 1080 to control ground squirrels on the Fort Ord complex, described in the DEIS, fails to meet even one of these criteria.

CREATIVE REASONING

41

The DEIS is remarkably candid in revealing the process whereby the Army arrived at its determination that a health threat from plague exists and, therefore, that an exemption from the Executive Order for the use of 1080 on federal lands is appropriate. In the process, however, the DEIS also provides insight into the Army's true motives for its proposal.

In his June 11, 1976, letter to the Director of the California Department of Public Health, the Surgeon General began by noting,

> I know you are familiar with the problems posed by ground squirrels at the several installations in the Fort Ord military complex since the termination of control measures in 1971. Of concern to me, and I am sure also to the State of California, is the potential public health threat engendered by their excessive numbers. (p. 112)

He then went on to report that a research program over the preceeding 16 months had yielded over 1,200 rodents, but that none had been found positive for plague. Although serological evidence of plague had been demonstrated in sera from 1 coyote, 1 cat, 8 dogs and 1 ground squirrel, suggesting the existence of plague foci in the vicinity, the surveillance had not been extensive enough to locate them. (p. 112-113)

While investigations of other ground squirrel control agents showed encouraging results, he explained that, "it seems possible that a control program might have to be initiated before the value of newer measures can be demonstrated unequivocally." (p. 113)

With this background, the Surgeon General then observed that, "One of the possible exemptions to the Executive Order against the use of toxicants with secondary effects, including 1080, is the demonstration that a hazard to human health exists." He then asked the Director,

> What evidence would be appropriate to declare that the excessive number of ground squirrels constitutes a hazard to human health? (p. 113)

In responding to the Surgeon General, the Director of the California Department of Public Health, in his June 30, 1976, letter, wrote:

> Ground squirrels that occur in areas of substantial human activity are a <u>hazard when they or their fleas show evidence of zoonotic disease</u>, in particular bubonic plague. They also become a <u>matter of concern</u> when population levels exceed the ecological carrying capacity of the area, thereby increasing the epizootic potential should disease, such as plague, be introduced into the population. (emphasis supplied) (p. 114)

Interestingly, the Director's letter to the Surgeon General makes reference to "the hearings at Hunter Liggett in April" (p. 113) and "the April meetings at Hunter Liggett" (p. 114), all of which preceded the Surgeon General's June 11, 1976, letter, yet there appears to be no other mention in the DEIS of these hearings and meetings, their attendance, their purpose, or their results. They would perhaps explain, however, how the Surgeon General knew the Director was familiar with the problems caused at the Fort Ord complex by ground squirrels and why he was so confident the Director shared his concern over "their excessive numbers."

In any event, by the Department's criteria, no "hazard" exists since neither the ground squirrels nor their fleas show evidence of plague, and the ground squirrel populations at the Fort Ord complex represent, at most, a "matter of concern."

41 Nevertheless, the August 17, 1976, meeting with the Departments of Agriculture, Interior, Health, Education and Welfare, the Environmental Protection Agency, and the Council on Environmental Quality was designed, apparently not to examine objectively an existing health emergency, but rather,

> The objective of the meeting was to present evidence that a threat to human health exists and to solicit the opinions of the agencies represented as to whether we have a basis to seek such exception to the Executive Order for use of a toxicant having secondary effects for rodent control. (p. 96)

It is difficult, therefore, for the reader to escape the conclusion that the Army's principal motivation for the proposed control program utilizing 1080 is the damage to military structures by the ground squirrels, and that the alleged crop and range depredations serve as ancillary support. However, since such damages do not constitute adequate justification under the Executive Order or Army policy for the proposed program, it appears that another justification had to be created. Under both the Executive Order and Army policy, that justification could be based only upon a human health hazard. (See, for example, pp. 120, 121)

Thus, rather than having first determined that a plague emergency existed and then having sought exemption under the Executive Order, it appears that the Surgeon General first sought to determine "what evidence would be appropriate" to obtain the desired exemption, and then tailored a justification to suit the emergency provision of the order.

THE REAL PROBLEM

42 The Army has determined that high ground squirrel populations occur on some areas of the Fort Ord complex, but it appears to confuse cause with effect. Rather than recognizing the ecologic conditions contributing to the high ground squirrel populations as the real problem, the Army sees only the resulting damage. Consequently, it proposes a symptomatic

poisoning program that might best be likened to throwing water on the fire bell. Paradoxically, however, the DEIS itself reveals the real problem:

> In addition to grasslands, ground squirrels are known to occur on sites disturbed by grazing and by human activities such as construction, grading, firebreaks, fills etc. (p. 39)

At Fort Ord,

> Several colonies were found taking advantage of concrete slabs, junk piles and the airfield runways . . . (p. 40)

At Fort Hunter Liggett,

> . . . typically the colonies are based on some anomaly such as a lone tree, rocky outcrops, dry stream banks or mounds of earth pushed up by past military operations. (p. 40)

At Camp Roberts,

> Squirrel colonies . . . are numerous along road cuts and embankments, dry stream banks and abandoned military objects such as old tanks. (p. 41)

Studies show

> . . . that ground squirrel populations . . . tended to decrease after grazing was removed from the land . . . There was . . . a significant difference on natural sites where grazing was completely excluded . . . . . . regardless of whether grazing is light or close, alteration of plant species and density of forage cover by grazing of California annual plant type leads to an increase in the ground squirrel population. (p. 39)

> The grazed rangeland (grassland and oak woodland) of Forts Ord, Hunter Liggett and Camp Roberts are prime habitat for ground squirrels. (p. 61)

> Ground squirrels may be associated with both nonutilized as well as heavily utilized land and at Hunter Liggett are certainly associated with heavy utilization by livestock. (p. 83)

<u>Overgrazing and the Plague Threat</u>

The objectives of the grazing programs on the three installations of the Fort Ord complex are stated on p. 79:

1. Provide the multiple purpose use of these lands for military purposes, grazing by domestic livestock, public recreation, water conservation and wildlife habitat.

2. Protect the ecological balance to ensure the continued productivity of the land while permitting economic returns to the lessee.

The grazing program at Fort Ord involves one sheep lease on 6,031 acres (p. 23), or 21.5 percent of the 28,038 acre installation (p. 22).

> Generally, grazing on Fort Ord appeared to be of medium intensity and grass was being maintained. (p. 85)

At Fort Hunter Liggett, four cattle leases cover 106,390 acres (p. 28), or 64 percent of the 166,535 acre reservation (p. 27), while at Camp Roberts, one cattle lease (5,854 acres) and two sheep leases (31,237 acres) cover 37,091 acres (p. 32), or 87 percent of the 43,745 acre installation.

> Grazing on Fort Hunter Liggett and Camp Roberts appeared to be very intense. (p. 85)

> Biswell . . . states that the [Fort Hunter Liggett] reservation (October 1971) is considerably overstocked. (p. 81)

and he recommended,

> . . . burning mixed chamise and chaparral to encourage deer. (p. 81)

> In January 1973 Dr. Leopold reported in a letter to General Moore that the Hunter Liggett Reservation rangelands were severely overgrazed and that this depleted range could not support much wildlife. (p. 82)

> *Dr. Menke predicted unavoidable local overutilization* during the summer and fall of 1976 on grassland and woodland-grass range type, based upon the April livestock stocking rate, the planned reduction in livestock numbers and the low rainfall. (p. 83)

> Based upon qualitative inspection, Menke rates the Fort Hunter Liggett general range conditions as fair on a scale of poor, fair, good and excellent. (p. 84)

> Grazing on Fort Hunter Liggett and Camp Roberts appeared to be very intense. (p. 85)

The Army has conducted studies of the potential plague threat only at the Fort Hunter Liggett installation (pp. 67-74, 112-113), and the June 30, 1976, letter from the Director of the California Department of Public Health to the Surgeon General confirms that the Army's principal concerns involve the "ground squirrel problems at Hunter Liggett Military Reservation and Camp Roberts." (p. 113)

It must be regarded as more than coincidence that, while the Army alleges that a significant "threat to health from plague definitely exists at Fort Ord, Fort Hunter Liggett and Camp Roberts" (p. 110), it has determined only that,

> At Fort Hunter Liggett all of the factors appear to be present which may lead to a plague outbreak. (p. 74)

320

The correlation between grazing intensity and the ground squirrel problems is further demonstrated in the DEIS by the emphasis on:

> . . . the application of ground squirrel control methods on open range or extensive land areas at Fort Hunter Liggett and Camp Roberts. (Fort Ord ground squirrel problems are minimal on open range). (p. 177)

Perhaps nowhere, however, is the correlation more dramatically demonstrated than on the deliberately "mechanically overgrazed" baseball field at Camp Roberts where 329 ground squirrel burrows per acre were reported. (pp. 43-Table 6, 56-Figure 23) Furthermore, the DEIS clearly recognizes this relationship:

> Recreational playing fields at Fort Ord and Camp Roberts which are continually mowed and thus provide excellent ground squirrel habitat are heavily infested. (p. 49)

The Army's inability to distinguish between cause and effect and its unwillingness to deal with the obvious ecological relationships identified in its own DEIS--as well as its own motives--are clearly demonstrated by the remarkable observation that,

> A reduction in ground squirrel numbers will provide the opportunity to maintain at least the same number of grazing livestock on a given area, and to thereby provide an opportunity for range conditions to improve where overstocking or overutilization now exist. (p. 198)

ALTERNATIVES

With such an impoverished appreciation of basic ecological concepts, and its obvious bias for exploitative uses and technological "fixes," it is perhaps not surprising that the DEIS is able to propose only a poisoning campaign and to consider only limited modifications of that program as viable alternatives to control the ground squirrel populations at the Fort Ord complex. (pp. 117-194)

The DEIS acknowledges, for example, that,

> It would be desirable to establish one or more test areas on which the grazing intensity could be adjusted to determine the effect this would have on ground squirrel numbers. (p. 194)

43

But it dismisses any serious consideration of "Modifications of Grazing" as an alternative with such casual remarks as,

> . . . significant reduction of ground squirrels on grazed land would require almost complete exclusion of grazing. . . Futhermore, complete exclusion of grazing . . . did not eliminate ground squirrels. (p. 137)

The DEIS shows no similar compunction, however, about its proposed 1080 control program which it repeatedly admits will not eliminate the ground squirrels, either. (pp. 1, 35, 96, 144, 151, 198)

More importantly, the DEIS shuns the comprehensive consideration of alternatives for an effective, long-term solution suggested by its own information--and mandated by NEPA. These alternatives include:

1. Land use programs based upon ecological principles, rather than economic and political expediency.

   Lands should be managed by grassland ecologists instead of the District Engineer (p. 239) or the Deputy Post Commander (p. 243), with the objective being grassland, not rangeland, management, and the goal being the maintenance of grassland ecosystems, not cattle and sheep and grazing lease revenues.

2. Removal of abandoned military equipment and junk piles, and restoration of disturbed areas.

3. Development and implementation of an active, professional preventive medicine program. The elements of such a program already are outlined in the DEIS, and include:

   A. Surveillance

   1) Carnivore Blood Serum. Collect and submit 25 to 30 carnivore (coyote, bobcat, fox, raccoon, etc.) blood serum samples during the period February, March, and April each year. (pp. 110, 193)

   2) Rodent and Flea Population Characterization. Develop baseline data on species and densities of rodents and fleas potentially involved in plague transmission and determine the degree of human contact with such populations. Evaluate population densities at least annually, where highly susceptible rodent species . . . occur. (p. 111, 193)

   3) Rodent Population Observation. Where highly susceptible rodent species occur, observe rodent populations for unusual conditions (sick, sluggish or dead animals) that may signal disease activity. Observations should be accomplished at least twice monthly when rodents are active (i.e., when the mean temperature exceeds $40^{\circ}F$). (pp. 111, 194)

      Where plague is present or threatening, a systematic search for infected fleas and serologic surveys of rodents can further delineate the extent of the problem . . . (p. 65)

   4) Liaison Activities. Establish and maintain liaison with local and state health authorities to ascertain any potential plague activity in proximal civilian areas. (p. 111, 194)

   5) Epizootic Investigation. When unusual activity or dead animals are observed in the rodent population, or when plague activity is determined by carnivore blood serum analysis, an epizootic investigation will be initiated (as a minimum, investigations should include the collection of dead animals, trapping rodents for sera and flea collections, and swabbing burrows for fleas). (pp. 111, 194)

> Serologic procedures are essential in detecting plague activity in enzootic rodent reservoirs . . . Monitoring of activity and inactivity of various rodent species is important in assessing the extent of an epizootic in a given area. (p. 66)
>
> The ground squirrels make good sentinel animals since the presence of sick animals or carcasses of these rodents is usually a good indication of a current epizootic of plague. (p. 77)

B. Rat Control

Implementation of an aggressive rat extermination program, including rat-proofing buildings and reduction of breeding places and harborages. (p. 65)

C. Education

Education of military personnel and the public in endemic areas on the mode of transmission of sylvatic plague to man, protective measures against fleas and rats (p. 65), and on the early signs of bubonic plague and the importance of prompt medical attention when lesions or illness are first suspected.

D. Quarantine

When plague presents a real public health problem,

> Recommendations are made to officially or unofficially quarantine the designated area. Unofficial quarantine is suggesting that ranchers keep their men, family and pets out of the area. Official quarantine is closure of campgrounds, parks, etc., that are under county, state or federal control. (p. 77)

E. Immunization

In the event a serious human health threat should develop, personnel at high risk of exposure to plague (e.g., surveillance and control personnel and others working directly in an epizootic area) may be actively immunized to confer protection against clinical plague. (p. 65)

F. Medical Surveillance

Maintenance of active medical surveillance to assure prompt detection and appropriate treatment of early cases of plague in humans.

G. Exclusion

Use of squirrel-proof fencing to protect small areas of a few acres (p. 135), such as radar station mounds, earthen dams, ammunition bunkers, wiring, concrete foundations, recreational areas, and the San Antonio Mission (pp. 42-49)

H. Selective Control

> In specific areas where ground squirrel problems persist despite the measures outlined above (e.g., the airstrip apron, road banks, campgrounds, bivouacs, pp. 42, 49, 77), selective control measures, such as trapping, shooting, use of fumigants, anticoagulant baits and insecticide treatment of burrows, and destruction and flooding of burrows (pp. 128-132, 134-136, 139-149) may be utilized to reduce damage and potential human exposure.

Preventive medicine programs incorporating these measures have been successfully implemented over extensive areas, frequently under primitive conditions and with far less impressive resources than are available to the U. S. Army. The DEIS provides no evidence that these same measures could not be effectively implemented on the Fort Ord complex where the population at risk is easily accessible for education and medical surveillance, where human movements can be carefully monitored and, if necessary, rigidly controlled, where modern medical expertise is readily available, and where the entire area is under the jurisdiction and control of a single federal agency.

CONCLUSIONS

44 1. The DEIS fails to demonstrate that a human health emergency from plague exists at the Fort Ord complex.

45 2. The DEIS fails to demonstrate that the alleged ground squirrel problems cannot be dealt with with means which do not involve the use of chemical toxicants that cause secondary poisoning.

46 3. The DEIS fails to demonstrate that the proposed use of 1080 to control ground squirrels is essential to protect human life.

47 4. The DEIS fails to demonstrate that the proposed use of 1080 to control ground squirrels at the Fort Ord complex satisfies the qualifications for exemption from the Executive Order prohibiting the field use of 1080 on federal lands.

48 5. The DEIS fails to analyze the environmental impacts of its current actions and to recognize the ecologic factors contributing to the alleged high ground squirrel populations.

49 6. The DEIS fails to provide the rigorous, comprehensive consideration of alternatives required by NEPA.

50 7. The DEIS represents a justification of a decision already made and based upon improper motives, rather than an objective, detailed, interdisciplinary analysis of the alleged problem and the proposed action.

51 8. The application by the Army for exemption from the Executive Order for the proposed use of 1080 to control ground squirrels on the Fort Ord complex, if granted, would set a dangerous precedent for circumvention of the emergency use provision by federal agencies on lands throughout the West. The DEIS fails to consider the environmental impacts of such a precedent.

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Clin. H. Callison
Executive Vice President
3/18/77

1. Executive Order is not accurately paraphrased. Restriction applies to field use of toxicants to control predatory animals and field use of toxicants having secondary poisoning effects to control animals.

2. True. Reservoir is probably a poor choice of word to describe the hazard and leads to many semantic entanglements farther on.

4. True, there is no way that past crop damage can be adequately assessed after the fact, since the crops are no longer present. In the future, accurate and documented crop losses could be compiled but it would require time and expense. Since justification of control is a health hazard such documentation, however, is not essential.

5. True, but see response to 4.

6. All of the elements necessary to constitute a plague threat are present: high ground squirrel populations, presence of high density of vector fleas, presence of plague bacillus in the general environment, and high likelihood of human rodent contact. All of this can be documented. The documentation of enzootic (sylvatic) plague at all points in time and space *is not necessary to prove a human health hazard.*

7. See 6 above.

8. These data are fragmentary, however, and should only be interpreted as qualitative evidence of current activity due to plague bacillus in the vicinity of the Fort Ord Complex.

9. True. Most such data pertain to areas enzootic for plague. In a paper by Rust et al. (1971, J. Inf. Dis. 124 (5): 527-531), however, a comparison is made between enzootic foci in New Mexico and Southeast Asia and non-enzootic areas in Arkansas, Illinois, Maryland, and Virginia. In non-enzootic areas in the Eastern states, the incidence was zero. In enzootic areas, the incidence ranged from less than 0.1 tc 85 percent. Other comparisons of interest are made.

10. True, but response to 8 applies here. Additional data would be valuable. The exact locations of positive serology finds is probably of less importance than the general location since the larger carnivores move over substantial areas to feed. Dogs found with positive serology are likely to be found in the cantonment area if that is their home. Samples collected were within 2 to 3 miles of symbol of areas sampled, Figure 29. The dogs were domestic dogs.

11. Partially true. Evidence of a very substantial increase in ground squirrel population density is available in results of road counts made in 1968 and again in 1976 by the same individual at Fort Hunter Liggett. See Table 5a. They show increases ranging from 1.7 to 13 times in various areas (reported by LAIR). Unfortunately, there are no simple or rapid methods of assessing the actual ground squirrel population over such a large area. There can be little doubt, however, that ground squirrel populations in the area are at a high level.

12. Not strictly true. Both counts vary with frequency of trapped squirrels. The figure shows a high average incidence of fleas (more on the meaning of "high" below) during the entire year. The factors which could be responsible for species-specific fluctuation are many and varied, and speculation on causes and effect are beyond the scope of the DEIS.

13. True. These are data summaries. See changes in Figures 30 and 31.

14. True. Data are available from New Mexico State Department of Health and Social Services for flea counts from rodents and lagomorphs collected in association with human cases of plague during the years 1974-76. In general, flea counts at FHL are considerably higher than those associated with the New Mexico surveys. A summary of these data is shown in Table 9. Flea indices averaged only 1.50 for 111 citellids collected at 17 sites in connection with 8 cases of human plague during the month of September. At FHL, on the other hand, citellid flea indices averaged about 7. The flea counts are high, by any means of reckoning.

15. Suggestion that term reservoir be eliminated applies here. Also, DEIS claims squirrels are a potential reservoir.

17. Human health hazard is not dependent upon squirrels acting as a reservoir. They could certainly serve as amplifying hosts. Because of varying definitions of the term reservoir, and because precise definition of term is not germane to actual circumstances, the term "amplifying host" will substitute for "reservoir."

18. See response to 17.

19. Substitute amplifying host for reservoir.

20. True, but significance of ground squirrels to ecology of plague is well documented, historically and in recent studies. (See Link, V. B. 1955, History of Plague in the U. S. Publ. Hlth. Monog. 26). It is the high ground squirrel populations which constitute the important rodent aspect of the plague hazard. The ground squirrel (and in other areas, the chipmunk) is the mammal most often directly implicated in human cases of plague in California. The proposed action is aimed at disruption of this particular disease transmission path.

21. It has been shown to bite man, transmits plague rodent-to-rodent and is thus a potential human vector.

22. Probably true.

23. Not a direct quote.

24. True. See response to 6.

25. This generalization applies to urban epidemic plague. Also, a statement such as "to any serious extent" is impossible to evaluate in terms of risk under the specialized circumstances that obtain at the Fort Ord Complex (outlined in response 6).

26. True, but the incidence of contact is much higher than average on Army field training installations. Miller's statement is true if you consider the general human population.

27. Again, may be generally true, since statement says "as a rule." The Fort Ord situation does not fit "as a rule" however. The danger of pneumonic plague also does not fit "as a rule." The Army should not have to face the risk of sporadic cases in any event.

28. More complete data are presented in Table 9.

29. Endemicity of plague in California in vicinity of Fort Ord is well established. Again, see response to 6.

30. True, but it is an unhappy fact that plague must be treated quickly and that failure to diagnose early has led to fatal outcomes.

31. Disagree with this conclusion. It is easy to substantiate facts outlined in response to 6 and this should be the basis of the assessment of risk.

32. Carnivores are highly mobile. It is impossible to pinpoint plague foci based on available evidence.

33. Additional data from New Mexico have been included in Table 9, and other information added to Figure 31. See page 82.

34. This may be true of ordinary circumstances. It may not be true where chance of human/animal contact is greater than average or where susceptible rodent populations are very high.

35. This depends upon rapid diagnosis and treatment. There have been tragic deaths due to undiagnosed plague. Humans should never be asked to serve as disease sentinels.

36. By the time human cases appear, vaccination is of limited use.

37. "Potential hazard" is a redundancy.

38. On balance, 1080 is the most effective material for this purpose, with the least environmental impact, secondary poisoning effects notwithstanding.

39. Because an adequate substitute (carbaryl) for flea control is available. There is no such substitute rodenticide.

40. If this is in support of an exemption from Executive Order 11870, then application would be needed for each treatment.

41. The facts speak for themselves.

42. Debates about motives are unproductive. Question is validity of claim of health hazard, not purity of motives.

43. There may be some validity to this. Fort Ord Complex, however, is not maintained for the purpose of growing grass. In range impact areas, for example, luxuriant growth of grass represents a hazard due to fire when the grass dies. Range studies now underway at Fort Hunter Liggett may demonstrate the value of limiting cattle grazing as a method of reducing ground squirrels.

44. There can be no quantitative criteria to establish what constitutes an emergency. Although this needs to be reinforced with additional data, the presence of a high density of ground squirrels, the presence of high densities of vector fleas on the squirrel, the existence of current plague activity in the vicinity, and the chance of human-animal contact constitutes an emergency.

45. This is covered in the DEIS. The case made for 1080 is strong.

46. Follows from 1) demonstration of plague hazard, and 2) establishment of 1080 as rodenticide of choice.

47. Follows from above.

48. The DEIS covers this in detail.

49. Disagree. DEIS does more than adequate job of this.

50. National Audubon Society has inadequate evidence of this.

51. Not true. Application must be made for each treatment. Furthermore, judgement of precedent as "dangerous" is not warranted, since exception is amply justified. If precedent is dangerous, then so is the Executive Order.

Defenders OF WILDLIFE

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STATEMENT BY WYMBERLEY COERR
AT PUBLIC HEARING FOR THE DEPARTMENT OF THE ARMY
ON DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR
GROUND SQUIRREL CONTROL, FORT ORD COMPLEX
KING CITY, CALIFORNIA FEBRUARY 24, 1977

Recommended Use of Selective Weapons

The draft EIS declares that "The major beneficial impact will be a significant reduction in the threat to human health (plague)." (Page xi)

The target, therefore, is the plague bacillus, Pasteurella Pestis. (P. 64)

1 This bacillus is associated with a flea, which is associated with the ground squirrel, which in turn is associated with the total community of wildlife.

This wildlife community is not an enemy to be destroyed. It is part of our American heritage. It includes the bald eagle - our national symbol - and the golden eagle, which are completely protected by law, and several species, such as the kit fox, that are already endangered or threatened.

To attack the bacillus we need to employ not a blunderbus but a rifle. We need a weapon or weapons that will reduce the bacillus effectively to protect human health and selectively to protect non-target wildlife. The proposed aerial application of 1080 on range land is questionable on each count.

2 With regard to human health, the EIS states, for instance: that infective fleas leave dead hosts (P. 72); that ground squirrels make good sentinel animals because their carcasses can indicate a current epizootic of plague (P. 77); that "The work of the Public Health Service is made easier if ground squirrels are not (emphasis added) poisoned" (P. 77); and that it is unnecessary to control a large area where human-ground squirrel contact is low (P. 78).

3 With regard to wildlife, the EIS questions the hazards of 1080's secondary poisoning effects if 1080 is applied with adequate techniques. The knowledge of 1080's secondary effects, however, is at the moment so insufficient that EPA, Interior and California's Department of Food and Agriculture are about to commence in June, 1977, an 11-months study of the effects of 1080 on non-target species. Until we get that study's results we should guard against the risk that 1080 is in fact a blunderbus, and we should not turn it against species already in trouble.

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4 If immediate action is necessary, I recommend a variation of Alternative 2 proposed by the EIS, the control of a buffer zone and areas of human use by diphacinone in bait boxes for the squirrels, along with carbaryl and fumigants for the fleas. I did not find in the EIS an estimate of diphacinone's effectiveness but I heard Letterman Army Institute of Research report, at last September's meeting on 1080 at Fort Hunter Liggett, that its preliminary studies in the area had shown diphacinone to be 70% effective against squirrels in two weeks. This would compare favorably with the 60% claimed in the EIS for zinc phosphide.

5 For future action I recommend that the Army actively pursue two lines of research, chemical - against the fleas, and biological - against the squirrels.

Army experiments have shown encouraging results in the use of chemicals, such as Phoxim, as systemic poisons against fleas (P. 78). These are fed to the squirrels in bait and kill the fleas after having entered the squirrel's system. At last September's meeting Letterman described its initial results as "very encouraging". A similar report has come from Army-financed research in New Mexico.

The EIS states these system poisons are still "under experimentation" (P. 143). This may be misleading. I have been told informally by Letterman that its studies at Fort Hunter Liggett have ceased because the funding was cut off by a decision of the Congress.

The great potential advantage of a systemic poison in bait is that the squirrels come to it, unlike a poison such as carbaryl that must be taken to the squirrels at great logistic effort (P. 114 -"...dusting burrows over hundreds ... of acres ... may be impracticable.").

6 The combination of diphacinone with an effective systemic in squirrel bait would indeed be a practical and selective weapon for killing the bacillus without peril to endangered and threatened species. The EIS should call strongly for more research.

7 One the biological side, the EIS mentions the possibility of introducing predators for rodent control but seems to dismiss the idea for lack of evidence that predators could keep the populations down to levels acceptable to humans (P. 138). It is obvious, however, that more predators could take more squirrels and thus help, if not solve, the human problem.

Noted 8 If it is decided not to use secondary poisons on the Fort Ord Complex, I urge the Army to study the advisability of introducing, for example, more kit foxes, which are listed as endangered ("Rare" in California) primarily because of loss of XXX preferred habitat.

***

1. Agreed. The wildlife community is not the enemy, but to break the mode of plague transmission it is necessary to attack the disease at the most vulnerable points in the cycle of events. Attacking the fleas and their primary host, ground squirrels, is the best known approach to the problem.

2. The statement to the effect that since ground squirrels make good sentinel animals for plague, thus should be left to make the work of the health officials much easier, represents a philosophy which is not universally supported (see answer number 1 in Koford letter).

3. Some action is necessary on the Fort Ord Complex before this study will be completed. Similar studies have been conducted before, only on a more limited scale. One cannot foresee the results of the 11-month study as necessarily being definitive one way or the other, and additional time and studies may still be necessary for verification.

4. The effectiveness of diphacinone has been demonstrated to vary in different situations, but it generally is considered an effective rodenticide. The necessity of repeated baitings in order for the animal to receive a lethal dose makes this method too expensive except for relatively small areas.

Diphacinone would be expected to produce 70 percent control under most conditions.

5. Systemic insecticides appear to hold great promise for flea control on squirrels; however, until adequate research is conducted and U. S. Environmental Protection Agency registration is granted, no such material can be used. Letterman studies have ceased.

6. A surveillance monitoring and testing plan will be implemented at the Fort Ord Complex. It will be oriented toward collecting data which could be used to improve future control efforts.

7. There are little data to support the claims that predators are capable of reducing ground squirrel populations to acceptable levels. Several theories exist, but their validity has not been substantiated. Current knowledge does not support the practicability or feasibility of introducing additional predators.

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SIERRA CLUB ~ VENTANA CHAPTER

SIERRA CLUB COMMENTS ON

<u>DRAFT</u>

ENVIRONMENTAL IMPACT REPORT

GROUND SQUIRREL CONTROL

FORT ORD COMPLEX, FEBRUARY 1977

Submitted by

BETTY S. DAVIS

...To explore, enjoy, and protect the nation's scenic resources...

SIERRA CLUB — VENTANA CHAPTER

FOUNDED IN 1892

Colonel Charles L. McNeill
Director, Facilities Engineering
Department of the Army
HQ, 7th Infantry Division
Fort Ord,
California 93941

April 5, 1977

Dear Colonel McNeill:

I herewith submit comments relevant to the Draft Environmental Impact Statement (DEIS), 1 February 1977, "Ground Squirrel Control, Fort Ord Complex, California." These comments are made on behalf of the 165,000 members of the Sierra Club and the 2,500 members of its local, Ventana Chapter. We appreciate the opportunity to review the DEIS and your courtesy in extending the submittal deadline to April 6, 1977 for our response.

We would like to state at the outset that we realize the problems the Army, neighboring ranchers, and grazing lessees on Army lands under consideration here face as a result of the highly modified range conditions and unnaturally large squirrel populations on the Complex. We recognize that something must be done to bring these problems, and recent health concerns, within reasonable bounds, and thus we do not endorse a "no-action" alternative.

However, we also recognize that the squirrel-occupied installations involved have immensely rich and varied populations of other indigenous wildlife which are important in the general ecological scheme of things, as are the squirrels; and are greatly valued by persons both near and far away from the margins of the Complex. Furthermore, it must be remembered that bordering the installations involved, and compounding the possible ecological insult of the proposed action, are vast stretches of public lands -- the Ventana Wilderness Area and Los Padres National Forest -- which provide undisturbed habitat and refuge for a large variety of animals, whose natural movements take them into the military holdings.

We are firmly convinced that native wildlife and natural ecosystem relationships will suffer serious consequences if the Army carries out its proposed action as outlined, or either of its first two alternatives. Aerial distribution of highly toxic agents into the ecosystem is not a selective poisoning method, as is claimed. We believe opting for measures that may take a little longer and more effort and patience -- a combination of methods and treatments -- can be successful in handling a situation which did not occur overnight, and cannot be solved overnight!

We are confident that the Army will review carefully the record of the public hearing on the DEIS, and all comments submitted in response to the document, and will work for a reasonable and equitable solution for human, wildlife and ecosystem interests alike. We urge there not be the haste to come to such an important decision as there apparently was to produce the DEIS.

...To explore, enjoy, and protect the nation's scenic resources...

Before addressing specific sections of the DEIS, a few observations of what we perceive to be shortcomings or areas needing general comment:

1 1. The required public announcement of the DEIS (FEDERAL REGISTER, Vol. 42, No. 24, p. 6880, Feb. 4, 1977) contained an error and an omission. The closing statement, "Environmental impacts include the reduction of populations of other seed-eating rodents such as meadow voles, kangaroo rats, field mice and seed-eating birds due to secondary poisoning" (emphasis mine) is incorrect. Seed-eating populations listed will be reduced by primary poisoning due to ingestion of poisoned bait, not from eating poisoned animals secondarily. A more serious adverse ecological impact, that of predator population reduction due to secondary poisoning effects, was not mentioned -- an unfortunate omission, diminishing the accuracy of the announcement and the opportunity for adequate capsule evaluation of the Army's plan.

Noted

2 2. The DEIS lacks sufficient recent and local information on ground squirrel biology and ecology, as well as on other wildlife of the Complex.

3 3. The DEIS is unconvincing in its attempt to establish a "public health emergency" in order to justify the use of a prohibited chemical toxicant, Compound 1080 (details submitted in writing at public hearing on DEIS, Feb. 24, 1977). Even if such an emergency were present, or should arise, it is clear that it could be dealt with by means that do not involve such a highly toxic agent, banned by Executive Order.

4 An emergency exemption to use Compound 1080 for public health reasons appears unwarranted and unwise, since this agent --extremely toxic and without antidote -- would pose high health and safety hazards if placed in the very areas where humans would be likely to contact the fleas posing the threat. The Army cannot use 1080 in such areas for safety reasons. The open range areas where they plan to use it receive minimal human use and are of low risk. Thus, they do not comply with the Army position that "... a threat to human health is the only reason to use toxicants having secondary effects." Further, on the only element of the Fort Ord Complex where there has ever been a case of human plague (Fort Ord, 1928), and the installation receiving the greatest human use, they do not plan to use 1080!

5 Executive Order #11870 states that, in emergencies, "...only those combinations of toxicants and techniques will be used which best serve human health and safety and which minimize the use of toxicants and best protect nontarget wildlife species and those individual predatory animals and birds which do not cause damage..." It appears to us that the Army's proposed action does not conform to the above mandate but, in fact, does just the opposite with respect to the rich assemblage of nontarget species and predators on the Complex.

6 We believe the final EIS should include and consider the information that despite an alleged "emergency situation", all three installations of the Complex are presently being used for military housing and maneuvers, and by civilian and Army personnel alike for wide-ranging recreational purposes. Furthermore, the "emergency situation", announced suddenly during the 1976 election year (after years of burgeoning squirrel numbers and previously

7 documented plague foci on FHL and FO) has been ameliorated in areas of human exposure potential. Squirrels have been controlled in areas of high human use since Fall, 1976 with diphacinone, an anticoagulant; and fleas with carbaryl, a non-residual insecticide. As a result it is presumed that squirrels in human interface areas have been reduced to acceptable levels and the "emergency" is over. It would seem so, since the Surgeon General's office has declared that one case of plague on the Fort Ord Complex would be "unacceptable" -- certainly, if there were still a threat of such a possibility, the Complex would have been quarantined against entry. The fact is, that has not happened!

8 4. The DEIS makes it apparent that the action plan and agents chosen to alleviate squirrel problems on the Fort Ord Complex eventually will extend to various other military installations in the nation. The Army has been designated as the DOD lead component (p. 110) "... to develop a plan to control ground squirrels and other plague-susceptible rodents at applicable DOD installations." This places a significant burden of responsibility upon this branch of the military to consider carefully and choose wisely the most environmentally appropriate methods and agents available, since the choice presents far-reaching, long-term, and serious ecosystem implications for areas and wildlife species well beyond those of present interest on the Fort Ord Complex.

9 The "Leopold Report" of 1964, the "Cain Report" of 1971, and the Executive Orders #11643 and #11870 of 1972 and 1975, with amendments of 1976, all express extreme concern about and recommendations concerning the use of toxic animal poisons with significant secondary effects, such as Compound 1080. Current rebuttable presumption proceedings with respect to 1080, underway by EPA, further reinforce previous national concerns. Yet this is the agent of choice by the Army for treatment of extensive open range areas in the proposed action described in the DEIS.

10 We feel it remiss that the DEIS dismisses 1080's expected impacts as minimal and not long-term, despite the plan to apply it every 2-3 years, indefinitely, with accessory control measures with another poison in between. We believe the Army should, and will, take another look and reconsider its position and request for an emergency exemption to use such a drastic, overkill poison when safer methods are available to reduce squirrels to reasonable levels.

5. In our opinion, the DEIS may be deficient in compliance with NEPA, as follows:

11 A. The DEIS does not properly explore or evaluate all reasonable alternative actions, particularly those that might enhance environmental quality and minimize or avoid some or all of the adverse environmental effects associated with such a widespread, long-term control program. Rather, it restricts its "proposed action" for control on extensive open range lands, and the "alternatives" thereto (except "no-action"), to the use of unacceptable poisons, with known secondary effects (pp. 124, 126) and sublethal, residual, or cumulative impacts on nontarget wildlife.

12 It fails to give sufficient attention or weight to natural control measures or to much safer available agents that offer reasonable control capabilities, are less environmentally damaging, more economical (given Army work force potential), and

12 less energy consumptive. It ignores previous recommendations of the U.S. Fish and Wildlife Service against use of 1080; and of the California Department of Fish and Game against zinc phosphide.

13 Further, its Alternative II offers two choices, and thus is an alternative within an alternative; we suggest it be reorganized as IIa, IIb. The description of Alt. II (p. 176, 177) fails to indicate whether aerial or hand distribution of 1080 or zinc phosphide is intended; one finds the answer to this significant omission under AIR QUALITY (p. 182). Such poor organization in this, and numerous other instances, makes the DEIS difficult to evaluate and obfuscating.

14 To comply with the intent of NEPA, the final EIS should consider additional alternative actions. These could include combinations of revised range management practices, enhancement of predator cover and hunting opportunities, direct control methods, and the use of a poison less likely to cause long-term environmental repercussions.

15 B. The DEIS fails to examine adequately the adverse short- and long-term impacts of the "proposed action" and its "alternatives" on wildlife, the ecosystem and the environment. It briefly dismisses expected impacts as minimal and not long-term, depite open-ended prospect of dropping highly toxic agents on open range areas every 2-3 years, with additional poisoning in between as necessary. Such down-playing of probable, not possible, adverse impacts is unacceptable -- especially in view of past and present national concern about the agent of choice, 1080. The impression is that the DEIS is attempting to justify a decision already made rather than assessing in a responsible way all the methods available to it and all the potential environmental impacts of the proposed action and its alternatives.

16 Relegating to Appendix B notations on animals having habitat and/or food associations with ground squirrels (in a faunal listing, with asterisks indicating an "association", not what kind) reinforces the latter impression! The *annotations reveal that 68 species at Fort Ord, 78 at FHL and 66 at CR are associated with ground squirrels --how, to what extent, which may be most affected by the action, how their loss would affect other biota, etc. is not touched upon. However, it is apparent that those listed may be expected to be complexly interrelated and inextricably involved in food chains and community structures in which they, the squirrels, and many other animals and plants play minor or major roles. Yet no attempt is made in the document to evaluate what might happen in the whole picture after changes due to poisoning occur. The latter token effort, in the Appendix of the DEIS, to hint at complicated ecological relationships that might be impacted appears to ignore the intent of NEPA and is unacceptable, in our opinion. It is in the area of effects on wildlife that the most serious and adverse impacts of the proposed action will be felt; too little space in the 271-page "impact study" was devoted to this matter. Glossing over effects on a species by species basis does not present the total picture.

17 6. The DEIS neglects to discuss or tends to downgrade the possible impacts of the proposed action on a number of Endangered and Fully-protected Species present on the Fort Ord Complex. The action has the potential of both jeopardizing the continued existence of such protected species and modifying their critical habitat situation within the Complex. By proposing to use a potent secondary poison, such as 1080, where highly susceptible and

17 and protected animals and plants are present, and by neglecting full examination of its potential effects on all such species involved, the Army's DEIS has not fulfilled the obligations in Section 7 of the Endangered Species Act (PL 93-205), nor has it adhered to mandates of the Fish and Game regulations of the State of California. In our opinion, the legality of the federal action proposed in the DEIS could be challenged for failing to comply with the Endangered Species Act of 1972.

18 7. We would like to make comment on the testimony presented at the public hearing on the DEIS as to "unobserved" losses, or "minor losses", of nontarget wildlife species after aerial distribution of grain poisoned with 1080. We feel the individuals and agency representatives speaking on this issue have no hard evidence that such losses do not occur. Logic and circumstantial evidence indicate strongly that they do!

19 Noted Distribution of poisoned grain by air over extensive areas, some of it rough terrain (admittedly difficult of access for hand distribution, and just as difficult of access to monitor the results) make it hard to make comprehensive body counts, even if animals tended to die out in the open. But animals don't! Bodies of nocturnal rodents and their predators — hidden away in burrows, tree stumps, hollow logs or tree branches and crotches-- in brushy and heavily-wooded areas adjacent to the poisoned zone, are not going to be noticed; especially if the area is extensive and rough. In our opinion, the myth of there being "no significant damage due to aerially distributed 1080 on nontarget wildlife" in California is a cruel one. Hundreds of thousands of pounds of the most toxic chemical known to mankind, poured into the environment each year, has to take more than just a toll of ground squirrels and coyotes -- logic, alone, dictates this reasonable conclusion. There was adequate indication from ranchers testifying at the public hearing that there is a difference of opinion among even this special interest group as to the advisability of air-dropping 1080; several atested to its adverse effects witnessed, others who use it advocate hand placement, not aerial distribution. The Sierra Club is strongly opposed to aerial distribution of any rodenticide.

20 Noted It is important to recall that until two years ago, there was no sensitive or reliable test for 1080; thus negative results in animals suspected of having been killed by 1080 may be subject to question. In 1975 a gas chromatographic method was developed to detect low levels -- 0.1 to 0.2 ppm. This method takes 8 hours; the former one was much longer and even more complicated, with many variables and unreliable results. Even the new test "...should, however, be considered semi-quantitative since recoveries vary somewhat with the type of sample." (Peterson, J.E., Environ. Contam. Toxicol., 13(6):751-757). We understand another, even more sensitive method is currently under development by Dr. Andy Peoples, U.C. Davis, to detect levels at parts per billion and parts per trillion. Thus, the technical difficulties and expense of 1080-testing, combined with problems of getting carcasses to a reliable lab, until recently have precluded any large-scale testing of animals for which strong circumstantial evidence indicated death from 1080.

21 Noted We would also question how often the application of 1080 is actually supervised by state or county agents in pre-baiting and post-baiting surveillance efforts. We have already questioned the reliability of such surveys. But we neglected to mention that it is our opinion that the subtle or sublethal effects

Noted 21 on animals or the ecosystem would never be noted in the type of cursory monitoring activities employed to date.

8. We would urge consideration of the following possibilities:

22 Noted A. Since the lessees have no vested grazing rights on federal lands, and a reduction of grazing pressure would be a minor price to pay for the restoration of the range to a condition less conducive to high ground squirrel levels -- the Army stop all grazing as soon as possible and allow natural recuperation processes to start. It is our guess that this is an ideal time to take this unprecedented step, as we anticipate the squirrel population will decline due to the 2-year drought. Without pressure from cattle or an excessive squirrel population, the vegetation may be able to get a start toward modest recovery. In a year or so, perhaps, a moderate number of squirrels and a reasonable number of cattle -- on a moderately restored range -- may be able to forage together, minimizing the fire hazards in impact areas as necessary.

Noted 23 B. In conjunction with contemplated range and related resource inventory studies (p. 84), there be included investigations of grass and forb production on plots with squirrels alone, with cattle alone, and with both.

24 Noted C. Natural forces may cause a reduction of ground squirrels to acceptable levels before the final DEIS is certified and a final plan of action approved. Such a possibility should be carefully considered and watched for. The high squirrel populations on FHL and CR may be extremely susceptible to drought-induced starvation during the present second consecutive dry year in a row. Social antagonism and stress may result in fighting deaths and deaths from lowered resistance. Forage will be minimal and this factor may trigger a significantly lower reproductive rate in this year's breeding population or next year's survivors, if the drought continues. Natural pressure on survivors from a large population of golden eagles and other hungry predators, for which all prey items may be in shorter supply, may further reduce the population to acceptable levels without use of drastic poisons. Further, if predators are not killed by use of such poisons, they may be able to handle the subsequent, post-drought return of squirrels effectively, regulating numbers as is possible in normal ecosystem situations, where predator and prey are in reasonable balance. It is also possible that survivors of the "famine" may be weakened and susceptible to disease, reducing numbers even further.

25 Noted Natural factors if allowed to operate undisrupted may reduce the squirrels to acceptable levels in the next year or so; these should be carefully observed, starting now, through censuses, embryo counts, as well as observations of predator-prey ratios and interactions. Local ecological information of this sort is extremely critical for evaluating the success of any anticipated control programs.

26 Noted D. If any chemical measures are taken to control squirrels on the open range or buffer strips, such measures should be carefully monitored. Surveys of squirrels and nontarget fauna should be made on a variety of sample plots, in areas to be treated and in untreated areas, before and after poisoning, throughout different habitat zones and over a period of time adequate to determine both lethal and sublethal effects. Surveillance of the selected action should be carried out by qualified persons from appropriate

agencies and from the professional and academic community.

27 Post-poisoning studies of ground squirrel ecology and population dynamics in treated and adjacent areas should be initiated immediately after the action to document the results. Observations of "invasion and dispersal dynamics", litter size and success, sex/age composition of the recovering population, number of burrows occupied vs number vacant, etc. should be made. Experiments should be devised to determine whether the highest rate of kill really is the most effective, cost-wise and solution-wise; or whether, in the long run, a lower kill rate is more practical. There is some indication in the literature that the latter is the case.

Noted

28 E. The final EIS includes the following additional alternatives based on natural regulatory mechanisms and/or the use of a poison less likely to cause long-term environmental repercussions:

Noted

29 Alternative IIc: As described in Alternative II, except use diphacinone in bait boxes, hand-placed in the vicinity of burrow systems by Army personnel (sanitary corps?), in buffer zones described.

Noted

30 Alternative IId: As described in Alternative IIc, above, but in addition phase out or eliminate cattle grazing on open range to allow return of a moderate vegetative cover. At appropriate recovery stage, reintroduce cattle in numbers adjusted to reducing fire hazard but avoiding overgrazing.

Noted

330

31 Fence off and allow no grazing or Army use of the buffer strip next to agricultural lands, in order to slow down an invasion by squirrels who may find the tall grass unattractive. Place tall poles throughout open range and buffer strip areas to serve as observation posts for foraging raptors.

32 Quarantine open range areas, should a health problem arise there; and dust any such area needed for temporary human use with carbaryl to kill fleas.

Of the latter two suggested alternatives, we endorse IId, since it takes advantage of natural control measures; a selectively distributed, non-residual poison without secondary effects of any consequence; and is more economical, once initial fence construction has been accomplished. Using army personnel to distribute diphacinone makes it more economical than either 1080 or zinc phosphide as they are proposed for use in the DEIS, whether in the proposed action or Alternatives I and II.

SPECIFIC COMMENTS ON SECTIONS OF DEIS

Selected written comments are here included on sample sections of the DEIS, with attached pages from the DEIS annotated as time permitted. Examples of organizational or content discrepancies noted are also submitted. None of the foregoing review efforts are considered in any way comprehensive; there was simply too much needing attention for the time available.

It is recognized that for the brief time period allotted, the DEIS has brought together an amazing amount of material, some of it unnecessary and some of it too skimpy or selective to be able to make valid judgements about the total environmental impact of the proposal.

The information assembled appears to be biased consistently in the direction of the proposed action, and to a lesser degree toward the chosen possible alternatives. It downplays unashamedly possible effects on wildlife and agents less hazardous for ground squirrel control. It contains contradictions and omissions, much unsubstantiated or selective information, and unfounded conclusions. Its repetitiousness and organizational inadequacies made it difficult to critique — a complete review would have taken much more time than available.

COMMENTS

Summary

p.ix, par. 3: "Significant ground squirrel control formerly in effect upon these areas was last applied in 1971, and has not been resumed since Executive Order #11870 prohibited...etc."

33 COMMENT: Statement contradicts information (p. 4) that control ended after 1969 on FHL and after 1970 on CR -- not in 1971. "Present" use of anticoagulants and zinc phosphide without an emergency exemption clearly indicates these control agents were not banned by Executive Order #11643 and could have been used for control after 1971 to avoid damage to croplands and Army structures, as well as reduce the potential reservoir for plague. Correction is needed in citation of Exec. Order; #11870 is the # as of 1975; the 1972 # was #11643.

p. x, par. 1: "...a number of carnivores showed a positive reaction for sylvatic (bubonic) plague, indicating a source of the plague organism is present on military or adjacent lands. The Surgeon General's Office...etc."

34 COMMENT: The plague bacillus was detected on FHL in the years 1941, 1942, and 1970 and is known to be enzootic in rodents in 21 counties of California, and many other parts of the West. Thus, more than just a "source" of the plague organism has long been known to exist at FHL and elsewhere statewide. Recent serological studies were not needed to alert the Army to the possibility of sylvatic plague. Yet despite knowledge of these former plague foci, and the availability of poisons used to control squirrels on other military bases, sciurids on FHL were allowed to reach high densities recognized as having "increased dramatically" in 1973 (letter, Apr., 1973; p. 5). Knowledge of the latter circumstances caused no plague alarm, nor in the present "emergency" has military and recreational use of the Complex abated (approx. 1 million man-days of recreation/yr.).

35 Noted

p. x, par. 2: Obscures the fact that there has been much more concern historically about "damage to vegetation" through overgrazing by cattle on FHL (on part of ranchers, public officials, professional range and wild-life biologists, and conservationist) than by ground squirrels. Grazing squirrels do not compete with browsing deer as efficiently as do grazing and browsing cattle (cattle browse line are apparent on native shrubs on parts of FHL). Dr. A. Starker Leopold, Prof. Dept. Forestry and Resource Management, U.C. Berkeley considers FHL "...severely overgrazed (by live-stock) at present"; Dr. John Menke, Ass't. Prof of Range Managemnt. once said (1975) that the lands at FHL are "the most over-grazed in California"; and more recently (1976) that "The high squirrel populations on Fort Hunter Liggett are certainly associated with heavy utilization by livestock animals." Eugene Gerdes (Cal. Dept. Fish and Game, ret.) witnessed a decline of deer as overgrazing continued over the years, that lessees were over their allotted numbers, and "certain bottom lands are used excessively." James Griffin, U.C. Berkeley, plant ecologist said (pers. commun.): "It may be seen clearly en route to The Indians (Natl. Forest land adjacent to FHL) that on the Los Padres Forest side of the cattle guard, there is more litter and perennial grass than on the Army side, where the ground looks like a pool table, it is so bare. On the Army side there is a burgeoning of obnoxious weeds, such as tar weed, which are nowhere near as numerous on the National Forest side, though grazing occurs there too, under contract." Even the Dept. of Army in 1974 declared: "The southern area (of FHL) appears overutilized...very dense areas of ground squirrels were found in the low cropped, fully utilized, cattle grazing areas..."

331

36

par. 3: This capsule description of the proposed action neglects to mention that the described program will not be a one-time effort but will involve poisoning on a biennial basis as needed, with each application taking an added toll of squirrels and other wildlife indefinitely. This omission should be rectified.

par. 4: "The reduction of ground squirrel numbers will have no significant effect on the ground squirrels elsewhere, and probably at least 10 percent of the present population on military lands will remain unaffected."

37

COMMENT: Tomich (1962) found that "In some colonies, populations were again high only a year after poisoning and trapping had effectively decimated them." This has been observed by others after poisoning or other cataclysmic events have occurred to sciurids or other rodents. Thus the remaining 10% will not remain unaffected -- enhanced reproduction, litter size and success can be anticipated. An invasion of vacated burrow areas will provide impetus for squirrels elsewhere to move in -- a significant effect. In recent experiments at FHL, after poisoning with diphacinone, Colonel Moussa of Letterman Hospital found reinvasion of the treated area occurred rapidly: "...within, six weeks, squirrel density exceeded the level estimated prior to treatment." (Pentagon Meeting, Aug. 17, 1976).

38 Noted

If "at least 10% of the population remains unaffected" by the action (out of an est. 7 to 10 million squirrels), nearly a million would remain — with their fleas posing a health hazard -- and it only takes one to do the job! It should also be noted that aerial distribution of 1080 in 1968-1969 apparently did nothing to stop a plague epizootic in 1970, the next year!

39

p. xi, par. 1: "The major beneficial impact will be a significant reduction in the threat to human health (plague)."

COMMENT: The open range areas where aerial distribution of 1080 is proposed pose no "significant threat" to human health; these areas receive limited human use and contact is minimal. A "significant reduction" in the alleged threat to human health has already been achieved (Fall, 1976; Spring, 1977) with diphacinone and carbaryl at human/squirrel interfaces, just as proposed in the DEIS. Military and civilian use of untreated, open range areas has continued unabated, indicating there really is no "emergency" in such areas -- thus no need for an Emergency Exemption to use 1080 there. Calif. Dept. of Health (p. 78) believe it "...unnecessary to control a large area where human-ground squirrel contact is low or absent."

Noted 40

p. xi, par. 2: The action may improve relations between the Army and the adjoining agricultural community, as stated, but won't improve relations with a much larger community locally, state- and nationwide -- a community of interests that respects the Exec. Order and finds the prospective loss of wildlife and disturbance to ecosystem integrity posed by the "action" totally unacceptable.

Noted 41

At the public hearing on the DEIS, 26 persons spoke against, 9 for the proposed action. Of the latter proponents, several were opposed to aerial distribution of 1080; most ranchers recognize the hazards and prefer to place it by hand.

42

Changed, Page XI

par. 3: This resumé clearly minimizes the potential adverse environmental impacts of the proposed action. Carried out on an indefinite basis as planned, the widespread, unselective aerial distribution of grain poisoned with the highly toxic Compound 1080 will result in the loss of more than just "some" coyotes, bobcats, etc. It has been estimated that at least 30% of coyotes are reduced in squirrel control programs with 1080 in California; they have declined sharply in San Luis Obispo Co. where agricultural interests have used 1080 for years. And there is nothing "unlikely" about what will happen to a San Joaquin Kit Fox on the Fort Ord Complex if it eats dead or dying ground squirrels, or other other rodents or insects poisoned by 1080 (vide Schitoskey, 1975). An endangered species, just beginning to extend its range in the area, should not be subject to such hazards, or to aerially distributed zinc phosphide, with its sublethal effects. The phrase "though unlikely" should be deleted and the following sentence should read: "Loss of seed-eating birds will occur." As is, the sentence is not only false but is totally contradictory to the preceding statement, para. 3, that the population of seed-eating birds "will be reduced".

Toxicants

43 Changed, Page 129 p. 124, par. 2: Should add quote from EPA "Rebuttable Presumption" Notice re 1080 (FR 41-232-52793, Dec. 1, 1977) which states that monoacetin is not "available in pharmaceutical grade" as an antidote.

44 Changed par. 3: Omits mention of birds that are not tolerant: quail, magpies, blackbirds, golden eagles, bald eagles, and condor, to name a few. Sayama and Brunetti (1952, Calif. Fish and Game, 38(3):295-299, at p. 298) state "Sodium fluoracetate is extremely toxic to California quail." They found minimal lethal dose to lie between 1 and 5 mg/kg of body weight. Golden eagles, bald eagle and condor are listed in Cain Report as killed by 1080 (p. 71, 72; 1972). The condor had 0.75 mg 1080 in stomach lining, crop contents and heart tissue; the golden eagles had from 0.02-0.86 mg in stomach contents, viscera or heart and liver tissue; the bald eagle had 0.24 mg in stomach contents.

45 Noted Leopold (1964, Trans. 29th No. Amer. Wildlife and Nat. Res. Conf, pp. 28-49, at p. 39) reports "In the Fall of 1963 two dead California Condors were picked up in an area that recently had been poisoned with 1080 grain to reduce the population of ground squirrels....The circumstances surrounding the death of these birds suggest that the condors may have died of 1080 poisoning acquired from eating dead ground squirrels." The skulls of these two birds were cleaned by dermestid beetles who died in the process; after boiling overnight, a second set of beetles fed on the skulls also died. Fairly strong circumstantial evidence!

332

The condor is as close to vanishing as any species can be; it is unthinkable that this sort of mistake may be permitted to recur.

par. 3: "Livestock may be susceptible" (to 1080); emphasis mine.

46 Noted COMMENT: Livestock are susceptible. Robison (1970, J. Wildlife Managemt., 34(3): 647-648, at p. 648) states "Sodium monofluoroacetate is extremely toxic to cattle. When it is used in grain or in other forms of bait that cattle might ingest, precautions must be taken so that it is not available to them." LD_{50}'s were 0.393 mg/kg for cows, o.22 for calves; as compared with 1.0 horse, < 1.0, swine, 5.0 chicken. The most deadly stock poison is an African plant, containing potassium fluoroacetate.

47 No human fatalities may have occurred in California but they certainly have elsewhere; statistics up to date should be given. Last year two children died in Durant, Oklahoma from eating cookies soaked in 1080; 3 others remained extremely ill. Pattison (1959) cites 16 fatal cases, up until 1959.

par. 5: "Poisoned animals may metabolize 1080 to non-toxic metabolites and/or excrete in the urine large quantities of a dose prior to death, thus decreasing the hazard of a true secondary poisoning." (Gal, et al, 1961, In: Atzert, 1971).

48 Noted COMMENT: Checking this reference we find that these are lab rats; that over a period of 4 days, in varying amounts, a total of 32% was excreted in rats fed 1.77 mg/kg; over 2 days (before death) in rats fed 5.0 mg/kg. It would appear 1080 in the urine is an additional source of trouble with respect to useful soil invertebrates.

49 par. 6. How often, and by whom, has a 90% population reduction been accurately measured, and under what sort of pre-and post-census methods? Is Marsh the only one who has documented this?

Noted 50 p. 125, par. 1: Not all soil bacteria degrade 1080, as this seems to imply; only species of Pseudomonas where they are present; and only 15% as rapidly as when on an easily metabolized substrate.

51 Toxicity in the soil for two weeks (at 10 ppm) and 11 weeks (at 50 ppm) would be more than sufficient to kill highly susceptible and important soil invertebrates. 1080 is an effective insecticide -- used to kill moths, fleas, mosquitoes, weevils, aphids, etc. Fleas are killed by feeding on poisoned rats (Pattison, 1959); aphids by feeding on plants watered with 1080, 1 mg/400 gm soil (David, 1950, Nature). Harvester ants were found susceptible by Marsh (1968). Obviously, the DEIS should have included remarks on 1080's hazards to insects.

Changed, Page 130 52 Investigations of David and Gardiner, and Hilton, cited did not determine whether 1080 underwent metabolic alterations once absorbed by plant leaves. This should have been noted in DEIS.

Noted, Page 130 53 par. 2: The hazards outlined in the Rebuttable Presumption Notice should be briefly presented here, not relegated to an obscure position in text.

Changed 54 p. 129, par. 4: Cost of diphacinone per lb. here is revealing; \$0.30 to \$1.00/lb. But in calculations to determine costs of treatment \$1.00/lb. is used. We understand it costs \$0.28/lb. in San Luis Obispo Co.

55 p. 131, Table 11: Dollar cost per acre, 1080, air distributed should read \$3.21, not \$0.14-0.16/acre.

Changed Page 134 56 p. 146, par. 3: Diphacinone here costs \$1.00/lb; on p. 129 cost given as 0.30 - 1.00 dollars/lb. If bought at 0.30 it would be 70% cheaper.

57 Changed, Page 162 par. 4: At an estimate of 1 bait box/50 burrows, would only need 30 (not 50) on Fort Ord, costing \$600 (not \$1000), and on Camp Roberts, next paragraph, would need 200 (not 400) bait boxes, costing \$4000 not \$8000. The latter was of course assuming the highest price per pound; if used lower price would be much cheaper. It appears that costs for diphacinone use are exaggerated.

Where are the figures for Hunter Liggett?? An omission? or Have the human use areas there already been taken care of?

58 p. 148, par. 1: The Surgeon General has indicated "There should be a quarantine upon activities of the military or the public (including pets) within treated areas" that have not had flea control. But plan is to dust only areas with carbaryl that have "significant human use". Will this mean quarantining areas of open range and around dam faces, water impoundments, etc., or buffer areas, if the proposed action (or Alt. I or II) are implemented? The quarantine would have to be from 3 to 6 months to be effective, according to California Department of Health.

59 p. 149, par. 1: The calculations presented to relieve fears about water contamination by 1080 seem fairly convincing. However, a map is needed to show the numerous intermittent stream courses and water impoundments, ponds, etc. on the properties. Dropping poisoned grain by air to within 100 feet of all streamways, etc. seems quite tricky, especially with

the ever-present chance of human error!

60 Noted p. 149, par. 2: The expected life of 1080 in water is enough for aqueous solutions to be used in poisoning rats, etc. A horse dies after drinking 10 liters of water containing a few drops of fluoroacetate (Pattison, 1959). 1080 is soluble in water to high concentrations, and may only lose a portion of its toxicity over time.

61 Noted par. 3: The possibility of 1080-poisoned squirrels and non-target animals falling into waterways and decomposing should be considered in the DEIS.

62 Page 185 par. 4: Neglects to mention that zinc phosphide coated grain loses only 23% of its toxicity after 29 days in outdoor conditions (Elmore and Roth, 1943). In 1963 bait exposed in field conditions for 3 months killed large numbers of geese on the Tule Lake Natl. Wildlife Refuge; and 500-1000 geese, plus ducks, partridges and rabbits were killed in the Netherlands in the same way (Rudd and Genelly, 1956).

Fauna -- Sodium Monofluoroacetate

333

63 Noted p. 150, par. 1: With respect to its relatively hazard-free history in squirrel control in California, there is no hard evidence such programs have actually been hazard free. To say "...but 1080, like all toxicants, has some undesirable characteristics which may result in some degree of unfavorable impact," is downplaying the known effects of the most toxic chemical known to man; a chemical now undergoing rebuttable presumption proceedings for its undesirable characteristics. Unfortunately, this is not the only example of downplaying the hazards of 1080 in this document.

64 Noted par. 2.: 90% mortality is scarcely "relatively " high, it is high! Factor (4) is an acknowledgement that pilots possibly aren't as accurate as might be desired. This is of concern with kit fox dens, and numerous small and large water courses, impoundments and dams in the area.

65 Noted p. 151, par. 1: Effectiveness not only of control but of impacts on non-target animals should be checked too (and in more than just "representative" areas).

66 par. 5: This paragraph means that many equally susceptible, non-target species will also be killed, as are the squirrels, with "maximum efficacy". Timing for squirrels will also be propitious for killing non-target animals, for similar reasons.

67 par. 6: Impacts on the environment have not been shown to remain at "such a relatively minor level" as stated. This is sheer presumption and downgrading of potential impacts; it should be omitted. Various animals have LD50's similar to or less than the LD 50 of 0.3 of squirrels: coyotes, 0.10; grey fox, 0.3; domestic cat, 0.2; bobcat, 0.6; kangaroo rat, 0.1; wood rats, <0.8; meadow vole, 0.92; rabbits, <0.8; magpies, 0.6; mule deer, 0.3; eagles 1.25-5; cows, 0.393; calves, 0.22; young pigs, 0.4; adult pigs, <1.0.

68 Changed, Page 172 p. 154, par. 1: Why aren't the species of "occasional" birds killed by 1080 presented here, to indicate possible impacts in a more meaningful way?

69 p. 154, par. 2: What color will bait be dyed? Over half a page discussion on dyed baits, with not an indication as to color planned?

70 par. 5: "Biodegradation by invertebrates seems likely." This is pure speculation!
For effects of 1080 on terrestrial invertebrates see comment on p. 125, par. 1.

71 p. 155, par. 1: Why aren't figures given here for effects on non-target rodents.

72 par. 2: This ignores the fact that 1080 is used for pocket gopher control! Gophers are very sensitive to 1080, LD 50 <0.05. This statement is sheer speculation. For the very reason that they do have fossorial habits, they would not be dying on the surface and be available for counting -- if counts were made?

73 Noted par. 3: The term "locally affected" here, and elsewhere commonly scattered through the DEIS, is ingenious. It makes the situation sound so limited and inconsequential. Where else would the effects be felt, except locally where the poison was placed? If there are enough locally affected areas, there is a lot of environmental damage. Of course, we might, by the same token, consider that the squirrel population is also just "locally affected", and thus the poisoning program is hardly worth while.

par. 4: "Occasionally small numbers of cottontails may be killed." (emphasis ours).
Not just occasionally; not just small numbers!

74 Noted A Riverside, California Press-Enterprise article states that its author went with a CDF&G warden into an area that had been recently treated with 1080: "Carcasses of dead cottontails lay throughout the hills ... they were victims of the Riverside County Agriculture Department's rodent poisoning program." Where just 2 weeks before there had been at least 25 pairs of quail, they saw none, but they did find a dead burrowing owl. Koford, with Joseph Keyes, noted a heavy kill of rabbits in 1956 (Kern Co.). Rabbits are a major food item for mountain lions, bobcats, coyotes, etc.
That "There is no current evidence that local populations are drastically reduced" is not unexpected. There has been no poisoning on the Fort Ord complex for 6-7 years; and who actually goes out and censuses rabbits before and after poisoning to be able to recognize a drastic reduction, if there were one?

75 Noted p. 156: The sentence, "When ground squirrels are in high numbers, they undoubtedly play some role in the diets of diurnal predators that are large enough to kill squirrels" (emphasis ours) has to be the classic understatement of the DEIS! The discussion ignores the fact that a lot of diurnal and nocturnal predators may find squirrels, and other rodents, dying above the ground, handy and deadly food items -- thus there will be some role for these carcasses.

76 Noted p. 161: "With the exception of the target species (ground squirrels), poten impacts on the fauna will be of a relatively minor nature."
From this statement it appears that the authors of this DEIS lack a sufficient ecological background to critically assess the impacts of the proposed action.

77 Noted — p. 162, par. 2: Neglects to mention that "The resistance extends only partially to slightly higher challenging doses, and the ratio of doses cannot be extended (Chenoweth, 1949)." [emphasis mine]

78 Changed, Page 182 — The DEIS statement "...repeated sublethal doses over a very short period of a few hours accumulated to lethal levels (i.e., dogs, rabbits, and mallards)" is misleading [emphasis mine]. In the case of the dog, it was not a few hours but 5 days.

79 Changed, Page 182 — The DEIS statement "...however, sublethal doses at longer intervals can be excreted as 1080 or metabolized to nontoxic metabolites by some animal species" is also misleading. It implies that all the 1080 is excreted, which is not the case -- only 30% over 4 days.

80 — The DEIS quote on cumulative effects from Rowley, 1963, appears to misinterpret his findings. In a 16-day test on rabbits, more than half did survive daily doses of 0.175 mg. 1080, but the others than didn't survive thus responded to the cumulative effects of this chemical!

81 — The summarizing statement of par. 2, "Compound 1080 is not considered a cumulative poison," is not only completely contradictory to the discussion that preceded it, but flies in the face of known realities.

334

82 — par. 3: "...the persistence of 1080 in the environment will be short, with little likelihood of persistance and cumulative features." This is a totally unwarranted conclusion! Scales (1945, Miss. State Coll. Agr. Expt. Sta., Farm Research 8(12):8) has shown that dogs have been killed by eating rats 8 to 10 weeks after they had been poisoned with sodium fluoroacetate. In Fresno, a dog digging up and eating a desiccated squirrel from an area poisoned 2 years previously died from 1080 (pers. commun., Araby Colton).

83 — David and Gardiner (1966) found 1080 can remain in soil from 2 weeks to 11 weeks, which is persistence enough to kill many invertebrates that aerate, condition, and turn over the soil; insects that pollinate plants or provide food for many other animals (birds, kit foxes, etc.).
Pattison (1959) says: "These facts, taken in conjunction with the general stability of the fluoroacetates under natural conditions, pose a serious problem for the ecologist, and stress the need for the utmost caution and foresight in the use of this type poison."

84 Changed — There should be mention in this section of sublethal effects described by Mazzanti (In Atzert) with respect to regressive changes in the germinal epithelium of the seminiferous tubules of rats. It is quite possible that reproduction of a variety of predators getting sublethal doses could be affected — and that of their young, being fed sublethal doses, also! The golden eagles come to mind in this speculation, as do the condors.

85 — p. 163, par. 2: States that zinc phosphide will be used along waterways and impoundments, yet on p. 164 it is mentioned that no potential hazard to waterfowl is anticipated (waterfowl are highly sensitive to zinc phosphide and may well be on impoundments; in fact are, as duck hunting is an activity in FHL).

86 — p. 165, par. 6: LD 50's for zinc phosphide and past history indicate that effects of this chemical on seed-eating birds will result in the loss of more than just a few -- especially applied during breeding or nesting season.

87 Noted — p. 166, par. 3: Schitoskey, and Bell and Dimmick (cf. DEIS), noted changes in behavior in animals ingesting small amounts of zinc phosphide. Under conditions in the wild, such aberrations could lead to death as effectively as ingesting a fatal dose of poison.

88 Changed, Page 188 — p. 167, par. 2: "There is no evidence that bird populations are significantly affected by its (zinc phosphide) limited use in ground squirrel controls in Monterey and San Luis Obispo Counties." [There is no evidence since, according to par. 1 above, zinc phosphide has not been used extensively for ground squirrel control and thus has not been studied as thoroughly as 1080.] The following sentence, "Based on this, there appears to be little danger to condors through its use" appears to be a complete non sequitur and presents a totally unwarranted conclusion.

Effects on Rare and Endangered Wildlife

89 Noted — With respect to rare and endangered wildlife on, or occasionally visiting, the Fort Ord Complex, the DEIS (p. 197) dismisses most of the species without individual discussion. It states that "The kit fox is the only rare or endangered species which may be affected." Even the kit fox is assessed as "unlikely" to be "significantly affected, if at all."

90 Noted — It is our opinion that any adverse effect would be significant on a population as small as the kit fox population on the Complex. There is apparently only one den on Camp Roberts and only one animal has been sighted at Fort Hunter Liggett (indicating a den there too, presuming that kit foxes range no more than a mile or two from their den). The kit fox population, to sum up, is obviously tiny -- it cannot sustain "some loss", as is blithely posed as a possibility in the DEIS, p. 197. Kit foxes are known to range 2 miles, feed on carrion (rodent, bird, or insect), and bring food back to their dens to eat. The young are thus vulnerable too. Guessing, as the DEIS does (p. 167), about whether kit foxes eat squirrels as carrion is irrelevant. It must be recalled that kanagoo rats, smaller rodents, and insects make up the major part of their diet and all these prey items are susceptible to 1080 poisoning. Such prey would also be moving about at night with poisoned grain in their cheek pouches, or possibly dying where kit foxes could retrieve them -- birds poisoned at some distance could also fly within range of a den and become a lethal factor. The studies designed to show that kit foxes in 1080 treated areas remain unaffected are totally unconvincing to critical reviewers. In our opinion, the proposed action is unthinkable within the range of an animal so susceptible, one just beginning to extend its range, and one protected by the Endangered Species Act.

91 — The California Condor, known from direct and indirect evidence to be susceptible to 1080 poisoning, is admittedly a rare and perhaps unlikely visitor to the Complex, but a possibility. With only around 30 left, it would be well to err on the side of caution. Peregrine falcons are in the latter category with respect to expected occurrence. Southern Bald Eagles, though rare, do periodically visit Naciemento and San Antonio Dams, and their watershed streams, and have been seen at Stony Valley (FHL), 1967, by Vern Yadon and Dr. Ron Branson, professional observers. If the Morro

92 Bay Kangaroo Rat is actually in the area, as indicated, it too would be very susceptible to both 1080 and zinc phosphide poisoning. It is a very restricted, rare mammal.

93 Changed Bobcats, now proposed for Endangered Species, pending decision at the U.S. Department of Interior, are highly susceptible to 1080 and would be especially vulnerable because they prey on squirrels, other rodents, gophers and rabbits -- all themselves easily poisoned with this agent. Mountain lions, found in their greatest statewide concentration on FHL (17 known) are fully protected by a moratorium on hunting. They eat rabbits, which are extremely susceptible to poisoning by 1080.

94 Changed Obviously, the Golden Eagle, fully protected under the Bald Eagle Protection Act (Code of Federal Regulations, 1975, Sect. #668, p. 875) is the animal, next to the rare kit fox, most likely to be affected. Golden eagles are numerous at FHL and known predators on squirrels. They are also known to be very vulnerable to 1080. The conclusion about their risk under the proposed action should be apparent, but they are not even mentioned in the summary statement on p. 197.

95 Changed In our opinion, the whole endangered and protected wildlife picture should have produced a great deal more alarm and attention on the side of caution in the DEIS than it has been given. The DEIS is clearly deficient in this regard; we assume the final EIS will rectify that shortcoming.

EXAMPLES OF MISCELLANEOUS PROBLEMS PERCEIVED WITH RESPECT TO THE DEIS

Citations

The BIBLIOGRAPHY needs complete checking over. There are many discrepancies noted just in the course of casual reading. The first reference noted as out of order, was coincidentally the worst one:

96 Changed "Westrom, D. and R. Yescott. 1975. Emigration of ectoparasites from dead California ground squirrels (Spermophilus beecheyi and Spermophilus richardsonii). California Vector News 22(12): 7-103."

it should read:

Westrom, D. and R. Yescott. 1975. Emigration of ectoparasites from dead California ground squirrels Spermophilus beecheyi (Richardson). California Vector Views, 22(12):97-103.

An error in title, publication, and pagination.

In addition, also noted were spelling errors in title and author; omissions of 5 citations mentioned in text; an omission of publication citation; a date, designated as [n.d.], which is given several places in text; incorrect citation of authors names (reversed from reference in text); omission of pagination, etc.

It was frustrating to find several interesting references in the text to a letter by Claire Dedrick (Aug. 14, 1976), yet find no reprinting of parts of this letter, at least, in the text [it is mentioned in the BIBLIOGRAPHY].

Corrections

97 Changed p. 17: The southern sea otter was designated a "Threatened" species by the U. S. Department of the Interior on Feb. 11, 1977. It should be so indicated here.

p. 19: Insert a (T) on Table 4, p. 19 opposite southern sea otter.

Contradictions

Among various noted, here is one sample:

98 Changed p. 163, par. 2. States that zinc phosphide will be used along streamways and water impoundments (where 1080 may be inappropriate).

but

p. 167, par. 6: After discussing the adverse effects of zinc phosphide on aquatic fauna, says that mitigation for these effects "...will be based upon avoiding the placement of zinc phosphide treated bait within the vicinity of any water impoundment- or stream."

Questionable Statements

Of many noticed, or pointed up in comments on previous parts of the DEIS, only two samples will be given here:

p. 160, par. 3: "Presently there is no evidence that condors have ever been killed as the result of 1080 used for ground squirrel control."

There is indeed very strong circumstantial evidence. Leopold (1964, Trans. 29th No. Amer. Wildlife and Nat. Res. Conf., pp. 28049, at p. 39) reports: "In the Fall of 1963 two dead California Condors were picked up in an area that recently had been poisoned with 1080 grain to reduce the population of ground squirrels...The circumstances surrounding the death of these birds suggest that the condors may have died of 1080 poisoning acquired from eating dead ground squirrels." Further circumstantial evidence relating to the same birds: Skulls were cleaned in the Museum of
99 Vertebrate Zoology, U.C. Berkeley, by dermestid beetles; the beetles died!
Noted The skulls were boiled overnight, a second batch of beetles put to work; they also died! 1080 was developed as an insecticide in Germany before World War II. This appears to be fairly strong evidence, though of course circumstantial.

336

The Cain Report lists a California Condor killed during predator control activities as having 0.75 mg 1080 in stomach lining, crop contents and heart tissue; this is certainly direct evidence, though of course the disclaimer in the above quote "as a result of 1080 used for ground squirrel control" eliminates this example as evidence (or does it?)

p. 161: "With the exception of the target species (ground squirrels), potential impacts on the fauna will be of a relatively minor nature."

The authors of the DEIS can in no way substantiate this statement. The use of the phrase "on the fauna", which could include every thing from soil, water or parasitic protozoans to mountain lions,
100 is apparently designed to make this statement an honest one. Incrementally, after years of poisoning, as planned, and wiping out a substantial portion of the "fauna" on the Fort Ord Complex, they could then say their actions had relatively minor potential impacts "on the fauna" of the central California area....etc. Incidentally, there are other non-target species even more susceptible than squirrels to 1080 (other rodents) which may be expected to receive similar impacts as those admitted for the ground squirrels; these would not be "of a relatively minor nature."

Misleading Content

p. 5: "Since the Executive Order 11643.....control programs using 1080 on the Fort Ord Complex have been discontinued."

From this, one gains the impression the Army had poisoned with 1080 right up until 1972, when the Exec. Order was issued. However, as
101 may be seen on p. 4 , they stopped poisoning at 1969 on FHL and 1970 on CR.

It is also apparent that aerial distribution of poisoned grain (1080) was only done once, 1968-1969 (half each year) on FHL, and 1969-1970 (half each year) on CR. Thus, many assumptions made about its "minor effect" on the area involved are just that, rank assumptions.

p. 77, last par. & footnote* thereto: A footnote refers the reader to the statement, in question as misleading, after a quote from the California Department of Health: "The Department deals with the problem in that area where, in their opinion, there is sufficient and frequent enough human contact with ground squirrels and their fleas to be a human health hazard."* [emphasis mine].

102

Changed, Page 85 *"The Fort Ord complex offers an excellent example of this type of interface where human contact with ground squirrels and fleas will occur." [DEIS].

This statement should read "Parts of the Fort Ord complex offer.... and fleas may occur." All of the Fort Ord complex does not offer the conditions mentioned in the Dept. of Health statement above, but one would certainly gain that impression from the footnote.

Material Prejudicial to Squirrels

There is a concerted attempt in the DEIS to point up adverse effects of squirrels and ignore any benefits or their important role in the ecosystem involved on the Fort Ord complex. Some of this is justified, but there is
103 an overemphasis that prejudices the reader against this natural component
Changed, Page 41 of the environment. An example is on p. 50, par. 1, where most of the information presented has no bearing on the situation surrounding the Fort Ord Complex, and adds to the anti-squirrel emphasis of the document.

Poor Organization of Text

A selected few of many examples:

104 p. 5, para 4; p. 6, para. 1,2: This section presents 1975 figures for acreage treated by 1080 in Monterey Co., to be compared with 1968 figures from San Luis Obispo Co. Figures for poundage of 1080 used in 1975 were given for SLO Co., but not acreage treated.

p. 146; par. 6: This paragraph should have been followed by data about squirrel control in areas of human activity at Fort Hunter Liggett. This
105 was omitted and there is no indication why. The information needed can be
Changed gleaned from studying various other sections and putting it together, but this should not be necessary.

Changed, Page 171 106 p. 154: Over half a page is devoted to extolling the virtues of dyed baits but I could find no indication of the color they were to be dyed in that discussion.

Material to be Added

Information on mountain lions. Mountain lions are now fully protected from hunting by a State Fish and Game moratorium and legislation. An extensive
107 study has just been completed on Fort Hunter Liggett, where the highest
Changed count in the State has been discovered. Yet the only mention of mountain lions

is on a faunal list in Appendix B. Maps from recent CDF&G studies showing known distributions of mountain lions on FHL and adjacent areas should be included in the final EIS. Mountain lions feed on rabbits, easily killed by 1080, and are wide-ranging animals; they may also feed on ground squirrels (Hornocker). Inclusion of this information is necessary to indicate potential hazards to this non-game, fully-protected animal -- vulnerable to the program planned.

108 Changed — Some mention of the fact that bobcats are now diminishing in numbers to the point that they are now being considered by the Department of the Interior for "Endangered Species" designation. Here is an extremely susceptible non-target, squirrel predator that needs more attention in the DEIS, and should get it in the final EIS.

Omissions

109 Noted — p. 2: No mention of the deadly effect of carbaryl dust on honey bees, yet beehives on the Complex.

110 Changed — p. 17: Mountain lion not listed among animals of the coniferous forest, but rare bears are.

111 Changed — p. 104: Section 5650 of the Fish and Game Code (1975) should be included in the DEIS (p. 108 of Code) -- concerning regulations about chemicals entering water supply containing susceptible organisms.

337

112 Noted — p. 81: Maps showing the intermittent (ephemeral) stream courses on the Fort Ord complex have been omitted and are needed to assess the impact of aerial distribution of 1080 or zinc phosphide. In May-June, when 1080 is so delivered, these streams may be running (in a normal or above normal rainfall year). Small waterways lead to larger ones, thence to rivers and dams with domestic water supply. Small waterways and ponds also contain wildlife and provide food items for many species. Such maps, taken from topographic sheets, should be included.

113 Changed — p. 146: Cost projections for long-range use of zinc phosphide are lacking, for accessory use described in para. 2. Also there is no indication how it will be applied.

114 Changed — p. 195: Mentions burrowing owls as inhabiting ground squirrel burrows but does not list the burrowing owl as an "associate" of ground squirrels on faunal list (needs *), p. 233, Appendix B.

115 — Other: Map of sites where serologically-positive animals were obtained, and indication of when.

116 — -Historical data on occurrence of plague epizootics or cases, number and species of animals and fleas involved, with respect to the 3 installations of the Fort Ord complex.

-Claire Dedrick's letter (1976).

-Information on what, if anything, has been done to protect Army, and civilian, recreational users of open range areas on the Complex since the "plague emergency finding" was announced.

-Discussion of sublethal and overall combined effects of introducing 1080 or zinc phosphide into the ecosystem indefinitely, and a discussion of sublethal effects on endangered species.

Downgrading of Attributes and Effects of Compound 1080

117 Noted, Page 129 — p. 150, par. 1: "...but 1080, like all toxicants, has some undesirable characteristics which may result in some degree of unfavorable impact."

118 Noted — p. 151: "Ground squirrels are among the most susceptible of all species to 1080, with an LD 50 of about 0.3 mg/kg...and this is probably the very factor that has kept impacts on the environment resulting from ground squirrel control at such a relatively minor level."

119 Changed — p. 154: "Biodegradation (of 1080) by invertebrates seems likely."

120 Changed — p. 155: "Occasionally small populations of rabbits may be killed."

121 Changed — p. 156: Here half a page appears to be devoted to downplaying after-effects of 1080 in a shameless attempt to minimize impacts on food supply of predators. The DEIS neglects to consider or list the non-target prey items of various sorts that will be in short supply, along with the squirrels, after poisoning with this agent.

122 Changed — p. 158: Here we find more of the same: "Circumstantial and other actual evidence indicates that occasionally dogs, coyotes or other..... mammals are indeed killed in squirrel control operations." No evidence is presented on how "occasional" this is. Further, the DEIS discredits a finding that "....ground squirrel control in California has assisted considerably in reducing coyote populations." (by saying), "although no evidence was provided to justify this contention." (Rudd and Genelly, 1956)

123 Noted — Although the authors of the DEIS have made unsupported contentions, throughout the text, when one is made against their thesis of the "relative harmlessness of 1080", they discount it. In the next sentence they dismiss Kalmbach's (1945) estimation of "30 percent reduction in the coyote population of treated areas" by claiming that effect is ancient history. Yet many of their references are just as ancient, and they have no hard figures of recent derivation to substitute.

p. 161: " With the exception of the target species (ground squirrels) potential impacts on the fauna will be of relatively minor nature."

Questions

124 Noted — p.p. 5, para. 4; p. 6, para.1: We note that zinc phosphide is currently applied only by hand by the County of Monterey, and is not used at all by San Luis Obispo Co. We question why the Army's Alternative I and II propose to distribute it by air, when apparently this is not a common practice with this toxicant and may be grossly unsafe for seed-eating birds and water fowl?

It appears more should be understood about this compound and method of distribution before it is considered for such wide use on such extensive acreages.

125 — p. 145: Why is the Army planning to use zinc phosphide on open range lands at Fort Ord, by hand (1 TBSP per 2-3 sq. ft. at burrow), whereas elsewhere on open range areas or buffer strips -- even near kit fox dens (p. 163, par. 2), it is to be distributed by air?

126 Changed p. 2: Will there be a quarantining of recreational areas of the Complex if a plague epizootic occurs?

127 - Why wasn't bait acceptance to birds of zinc phosphide tested before the DEIS was finished; or why isn't this information already available?

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In closing we wish to reiterate our appreciation for the opportunity to review the DEIS and for the time extension so courteously granted to us. We hope some of our comments will be useful in formulating the final EIS.

Sincerely yours,

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Enclosure: DEIS, annotated

2. Recent and local information has been included to the extent available.

3. Toxicity of rodenticide does not necessarily determine its hazards to the environment or to nontarget species. Anticoagulants, for example, are highly toxic compounds when compared on a mg/kg basis.

4. The open range area is used by military personnel during training. The open range receives minimal civilian use but substantial military use (see Col. Ambrose letter, page 283). Ford Ord does not have as great a ground squirrel population as Camp Roberts or Fort Hunter Liggett, therefore, other measures may be sufficient.

   All rodenticides which are proven effective on ground squirrels have secondary effects, and this includes 1080, zinc phosphide and diphacinone. The differences are in the degree of secondary hazards and which nontarget species is under consideration.

5. This is an area where there is a considerable amount of disagreement by knowledgeable individuals.

6. Unfortunately, the term "emergency" was not defined in President Nixon's Executive Order #11870, therefore, the meaning is open to various interpretations. The threat of a public health hazard must be reduced or removed at some point, preferably before illness and death in humans occurs.

7. The question of a quarantine of the area cannot be ruled out if the situation warrants it; however, the proposed action would, according to health authorities, alleviate much of the threat to humans making quarantining unnecessary at this time. Quarantining any one of the installations would seriously hamper the Army's primary mission.

8. The EIS was written expressly for the Fort Ord Complex. Since different species of plague-susceptible rodents are involved at the other installations, it is doubtful that much of the EIS would be applicable to the other installations outside of California.

9. 1080 is the most efficacious rodenticide known for ground squirrels. None of the cited references fully take into consideration the environmental results of substituting a less effective rodenticide for a highly effective one.

10. There is no documented evidence that 1080 used for ground squirrel control has any more than short-term effect on nontarget species. Other treatments following an initial squirrel reduction would be selected on the basis of information available at that time, considering any observed impacts from initial control measures or results from present Environmental Protection Agency study or other control or research operations.

11. Unfortunately, there are no known rodenticide baits which are registered in California for ground squirrel control which do not have some potential for secondary poisoning. The problem is immediate. Control measures, such as land use changes, would take considerable time to implement and cause ground squirrel reduction.

12. The attention given in the EIS to "natural control measures" is in proportion to the information known of ground squirrel control. Very little is known of "natural control measures" (i.e., predators, diseases, habitat alterations) as they relate to suppressing ground squirrel populations.

13. Comment noted. The application would be done by air.

14. Mechanical control and biological control are discussed on pages 143-150. There are no known available effective rodenticde baits that would be less likely to cause environmental repercussions. There are many possible combinations of control; however, the alternative presented appears reasonable for immediate action. Subsequent action should include information obtained from studies now underway or which will be gained from monitoring the proposed action.

15. The proposed action is basically the action which has been used for ground squirrel control in the surrounding area by agricultural interests for about 30 years. It is difficult to imagine that with the many concerned individuals in the area, that any significant long-term impact could have gone unnoticed or <u>unsubstantiated</u> for this length of time.

16. To attempt to adequately address the complex interrelations between ground squirrels and all other animals would be impossible because there are insufficient data available to make any pertinent statements which would be directly relevant to the EIS. Any efforts on a species by species basis would be less than adequate if they were based on theory or <u>conjecture</u>.

17. Comment noted. See response to Department of Interior letter.

18. It is impossible to prove a negative and, hence, hard evidence is absent. Hard evidence is also very scarce to show adverse effects on nontarget species.

31. The area referred to as a buffer strip is a firebreak zone, therefore, the grass must be kept down.

32. See response to Col. Ambrose and Lt. Col. Johnston's letters, page 284 and 293.

33. The Executive Order #11642 did not apply to the control of pests in and around buildings.

34. Evidence suggests that the higher the squirrel population, the greater the possibility of human contact directly with the squirrels or with their fleas. Hence, the situation becomes progressively worse so long as the population trend is upward. See Table 9, Reported Human Plague Cases By Year.

36. A continuing ground squirrel control program is discussed several times. Wildlife management, including the management of ground squirrels, cannot be achieved in a one-time effort. See answer to comment 10 above, also page 149.

37. Squirrel reinvasion is possible where high densities remain near a reduced population. This is why the buffer zone approach to regulating squirrel population is much less effective than an overall treatment.

39. See answer to comment 31 above.

47. The death of two children in Oklahoma was the result of 1081 and not 1080, as was reported in some newspapers. However, this does not imply that the accident could not have happened with 1080. It is interesting to note that the Executive Order #11642 does not apply to the use of 1080 or 1081 in and about structures where the possibility of accidental poisoning of humans may be greater than in other situations.

49. Earl Kalar is cited on page 168.

51. Remarks of the effects of 1080 on insects are found on page

55. Cost is dollars per acre <u>flown</u>, not per acre <u>treated</u>.

58. See pages 284 and 293. Responses to Col. Ambrose and Lt. Col. Johnston's letters.

59. See answer to Department of Interior letter, page 291.

66. Proper timing of a squirrel control program will leave the least amount of residual bait on the ground following the feeding by the ground squirrel. Since timing is linked to the biology and behavior of the squirrels, it may or may not correspond to that of other animals.

67. It should be pointed out that the LD99 may be quite different for two separate species with a similar LD50. The slope or shape of the dose response curve may differ between species. The degree to which hazards of 1080 apply to any given species is governed by more than the susceptibility of the animal to 1080, although it does play an important role.

69. 1080 squirrel baits prepared in California are always dyed yellow. The color of zinc phosphide bait varies with the source.

70. Insects consuming the bait is a form of biodegradation.

71. There is no way at present to quantify projections of non-target rodent kill. We recommend a pre- and post-treatment census for this reason. This information will be useful in making future decisions on the use of 1080.

72. When 1080 is used for pocket gopher control, it is placed in the burrow where it is available to the animal. Experimental trials of surface baiting for pocket gopher control has not resulted in successful control. The open hole census method has been used to evaluate results.

80. Rowley (1963) stated: "In a second experiment, 22 wild rabbits were fed 10 carrot baits containing 1/2 LD_{100} (0.175 mg/kg) every 12 hours for eight consecutive days; concurrently 11 other rabbits were fed 0.175 mg/kg at 24-hourly intervals for 16 days. Of the group fed at 12-hour intervals, 37 percent survived the test, as compared to the 54.5 percent which survived when dosed at 24-hour intervals".

81. The unfortunate aspect of Rowley's work is that there is no way of knowing how may of the rabbits treated would have died if they received only one offering of 1080 at the 0.35 or 0.175 mg/kg dose. Without this, the percentage of deaths given is meaningless as far as showing accumulated effects. In the 16-day study, the fact that no deaths occurred in the rabbits after the ninth day provides good evidence that 1080 is not cumulative or that resistance had developed. These rabbits would have received over 1.5 times a LD_{100} after the ninth day.

82. Crabtree (1962) stated that: "Although repeated doses of sodium monofluoroacetate has been demonstrated to increase the resistance of rats to subsequent doses, this effect appears to be short-lived and of little practical significance in its use as a rodenticide. Likewise, "1080" is not accumulative to any practical degree."

83. To further quote Pattison (1959), in the next sentence he states: "Nevertheless, in skilled hands, sodium fluoroacetate is one of the most effective all-purpose rodenticides known; ...".

85. Since most ducks frequenting the area are migratory, arriving in the fall, and since the bait will be applied in the spring, this reduces the chance for accidental poisonings.

86. There is no evidence that losses to seed eating birds is any greater during the breeding or nesting season than at any other time.

91. There is no supported evidence that the California condor is susceptible to 1080 poisoning.

92. The original range of the Morro Bay kangaroo rat was less than 4 sq. miles in San Luis Obispo County, California (Stewart and Roest, 1960). There have been no known reports of Morro Bay kangaroo rat sightings on the Fort Ord Complex. It was inadvertently included in the faunal list for Camp Robert and the list has been appropriately amended.

100. Since 1080 bait will be applied in the immediate vicinity of the ground squirrel colonies, it will not have similar impacts on the populations of other equal susceptible species of rodents. These other species will also occupy areas of the installations where squirrels are not located and, hence, a portion of the population will not have access to the bait. There is no other species of rodent that has a feed territory which overlaps that of the ground squirrel and is found nowhere else.

101. Following its development and up to the time of the Executive Order, 1080 bait had been used in the squirrel management program on parts of the Fort Ord Complex, although not annually. Aerial application methods were developed and came into use only a few years prior to the Executive Order and, hence, the technique was used only for the years 1968-1970. 1080 bait applied by air has been used on similar types of habitat in both San Luis Obispo and Monterey Counties and, thus, serve as a basis of information.

104. These figures are not intended for comparison, but do show that relatively small amounts of land were treated in either county.

115. Animals were obtained within a 1- or 2-mile radius of symbol for areas sampled. Animals were obtained between November 1975 and March 1976.

116. A. This data was not obtained.
B. Claire Dedrick letter is Appendix K.
C. The Army has developed a plague contingency plan.
D. The proposed action is not designed to introduce 1080 into the ecosystem indefinitely.

127. There was no opportunity for special studies of this type in the time interval available for preparation of the DEIS.

March 15, 1977

Commander
Attn: Director of Facilities Engineer
Fort Ord
Fort Ord, California 93941

Dear Sir:

Enclosed herewith are comments on the rough draft of the Environmental Impact Statement concerning Ground Squirrel Control, Fort Ord Complex, California. The comments represent the views of the Institute for the Study of Animal Problems and the Humane Society of the United States. We hope that these comments will be helpful in the preparation of the final Environmental Impact Statement.

Yours sincerely,

Michael W. Fox

MICHAEL W. FOX, D.Sc.,
Ph.D.,B.Vet.Med.,M.R.C.V.S.

MWF/cg

The Humane Society
of the United States

National Headquarters
2100 L Street, N.W.
Washington, D.C. 20037
(202) 452-1100

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

(February 1977)

GROUND SQUIRREL CONTROL, FORT ORD COMPLEX, CALIFORNIA

1. One of the major implications of this impact statement is that the ground squirrel abundance is an indicator of land misuse; there is no conclusive evidence that frequent application of poison control will not compound the problem of land deterioration.

2. There is clear evidence in the impact statement of overgrazing by domestic livestock which may improve the
1 habitat for the ground squirrel. (eg. pages 81, 82 et.seq. of the report).

3. Reasons for not controlling overgrazing would seem to be dictated by local politics although the impact statement suggests that if cattle were not allowed to graze in certain areas, there may be a fire hazard. This hazard is no excuse for permitting continued overgrazing.

4. A ground squirrel control program should give serious consideration to controlled and repeated burning of heavily infested areas near installations to limit the food supply of the rodents, and also to
2 act as a buffer for adjacent areas where overgrazing by domestic cattle should be stopped for such a period until the vegetation has recovered and the ground squirrel population has been reduced. Army land, leased for grazing purposes, should be "rested" and the stocking rate drastically reduced.

5. There is no evidence in the impact statement that the ground squirrels are actually a source of bubonic plague (page 73). Eliminating them on the grounds that
3 they are a potential threat to human health is contrary to the scientific evidence presented in the Army's impact statement. The data in the report shows that the greatest potential threat to human life are free-roaming and feral dogs. Thus, the need to control the

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5. continued-
3 ground squirrels to protect human health does not seem justifiable. A public health program of extermination because animals are an actual and real threat to human life is one thing, but to destroy them because they are merely a <u>potential</u> threat is illogical.

4 6. Although in the summary, the impact statement refers to crop damage on adjacent private lands, there is no evidence in the text of damage to crops. Also while suspected, no evidence is given to show that ground squirrels on these military bases will be a constant source of infestation, if not controlled, for adjacent farm land. The impact statement is lacking in sound behavioral ecology and population dynamics: Trap, mark, release and retrap studies to determine movement patterns, home range and migratory/colonoizing activities of ground squirrels are needed. Local political pressure to use 1080 on military bases is unjustifiable. A more rational and ecologically sound approach to the problem, which this impact statement does not offer, is needed.

The following points, for instance, have not been considered in the impact statement:

5 7. It is stated (page XI of summary) that no adverse affects are expected upon condors, vultures and raptorial birds. No clear evidence is given to support this view other than the fact that vultures are more resistant to certain poisons. Using a poison such as 1080 with secondary effects would surely affect raptorial birds and it should be emphasized (see page 19) that the southern bald eagles and peregrine falcon are in this area; endangered species whose safety cannot be guaranteed if a secondary poison is used. It is also stated that seed-eating rodents will be lost to poison and (on page 19) the Morro-bay kangaroo rat is listed as an endangered species in the area and is much more susceptible to poisons than the ground squirrel.

6 Noted 8. If 1080 were used, not only endangered species in the area would be affected but also since natural predators would undoubtedly be affected, a pathological dependency upon the continued use of such poisons would be necessary in order to regulate the ground squirrel population over the years. This surely is neither sound nor practical ecological management. More research is needed to develop a more biologically sound approach especially as it relates to range land management (overgrazing) and to minimizing the destruction of predatorial birds and mammals and other non-target species that would otherwise help regulate naturally, the ground squirrel population.

7 9. The use of 1080 cannot be justified on the basis that it is economically expedient to distribute it by air. This could be done with zinc phosphide grain bait (as stated on page 131 of the report)being also supported by dispensation by hand near human settlements and installations (or diphacinone). The insecticide, carbaryl, distributed into the burrows on such target areas is also logical and preferential to the use of more harmful agents such as DDT, which can have long term biocidal consequences throughout the ecosystem.

8 10. It is clear from statements in this report that the ground squirrel population would rapidly increase in numbers unless poison control is continued annually or bi-annually. Poisons alone may actually cause reproductive enhancement in the surviving population and thus, in the long run, chemical warfare without control of overgrazing and encouragement of predators could be ecocidal.

9 11. In so far as the human health concerns about bubonic plague, the problem has been over magnified; flea control around areas of concentrated human activity is the logical answer. The flea infestation may be helping to regulate the rodent population. If the poisoning is inefficient, the rodent population may actually increase more after reduction of the flea population.
10 Other alternatives should, therefore, be sought around such areas of concentrated human activity including repeated burning (to reduce food supply) or modifications of the vegetation to make the habitat less attractive to the ground squirrel. (eg. page 39 of the report "ground squirrels are rarely seen living in areas of heavy tree and brush growth or on ungrazed land where dense stands of grasses are present")

In conclusion, an objective review of the environmental impact statement leads to the logical conclusion that the use of 1080 to control ground squirrels cannot be justified. The only justification clearly presented in the impact statement is to improve public relations between the military and those whose grazing land is adjacent to such installations.

We would not be opposed to ecologically sensible and scientifically sound emergency measures. We would not be opposed to the use of poison with no secondary effects provided they were distributed to insure that the target species only will be affected. For a long term resolution of the problem, it is clear from the above comments and apparent in the impact statement that continuous poisoning is not the answer and yet this is, in fact, being proposed. This is ecologically unsound and not biologically appropriate. Ecologically beneficial control measures should be researched before such a long term control program is implemented, which should not necessitate repeated and extensive poisoning of public lands.

11 Noted

The preceding comments clearly show that the Ground Squirrel Control Environmental Impact Statement has many inadequacies and leaves many questions to be answered. It is unfortunate that the objective expertise of a behavioral ecologist was not utilized in the preparation of this impact statement because the population dynamics and movements of ground squirrels from military land to adjoining farm land has not been studied. The most serious flaw, illustrating either ignorance or more likely a total disregard for wildlife, is the proposal to use the poison, sodium fluoracecate (1080). Its use has been banned by Presidential order, not for political reasons but because it has such serious secondary effects throughout the food chain of prey and predator species. There are logical scientific grounds for not using this particular poison: That the Army endorses an impact statement proposing the use of 1080 as a means of animal control is a serious breach of their civilian responsibilities. To resort to such a poison program would be a violation of the trust and responsibility that the citizenry of this country have vested in their support of the Military Service.

A Plague or a Political (Public Relations) Problem?

12 Noted

All things considered, it still is debatable that the circumstances at the military installations warrant a panic response. On the basis of the serological finds of Plague in Mammals at Fort Hunter Leggitt (1975-76), Table 8, Page 73, of the Environmental Impact Statement, one would presume otherwise. The real reasons for ground squirrel control seem to be in terms of public relations (to satisfy the ranchers' concerns over a source of rodent infestation of their land from military bases: as emphasized below, there seems to be no concrete evidence that ground squirrels are a real threat to human health. Theoretically and potentially, but not in reality, they may be: such extreme action of poison control using 1080 based upon the human disease agrument rest upon faulty logic and inadequate data.

As stated on page 74 of the Environmental Impact Statement, "at Fort Hunter Leggitt, all the factors appear to be present which may lead to a plague outbreak", "appear to be", "which may lead", these are not NOW terms, that of a crisis or panic, calling for such drastic measures. The surgeon general's office summarized the circumstances in the following four points which I will answer in that order: (1) Yes, there is a highly abundant, susceptible host species in the areas in which people live, train, work and play. Such an overpopulation situation was inevitable when prior to 1971 all the natural predators of the ground squirrel were destroyed by the use of 1080 and after 1971, the species was allowed to multiply unchecked by the use of ANY rodenticide. (2) Yes, there could be high flea counts on the rodent hosts but are these fleas plague carriers? The serologic testing says no, not at the present time. Also, if we destroy the host for the fleas, who would be the replacement host; man himself? (3) Statement 3, that there has been a "marked increase this

year in the occurrence of epizootic plague and human cases throughout the western states, including California", is rather misleading. An increase from one to two cases is a 50% increase but you'd hardly call it significant. If one actually looks at the report on Table 9 of the Environmental Impact Statement, there has been a decrease in the incidence of human plague from

13 Page 75

1975 to 1976. The majority of plague cases appear to be from New Mexico, Colorado and Arizona and are defined as coming from rodents, not just squirrels but all rodents. According to the CDC Weekly Report, in several of these cases, the patient skinned the rodent that was the plague carrier. (4) The fourth statement, "evidence by carnivore serology of the existence, right now, of plague foci at the Ford Ord Complex or in the vicinity" is also misleading. That 1 bobcat, 2 coyotes, 9 dogs and 1 housecat showed serological evidence that there was exposure to plague some time, somewhere, does not pinpoint the focus of the infection. There should be some concern over this evidence but not an all out declaration of war on the ground squirrels just because they can have fleas too. The use of serology to determine the presence of plague is a complex process not just the listing of one titer as given in Table 8 of the Environmental Impact Statement. A positive serological titer means that the individual has been exposed to the bacteria which causes plague. It may or may not show any symptoms of the disease. In order to use serological titers properly, one must have multiple samples showing either a rise or fall in the titer. (This is true unless the titer is

14

1:128 or 1:256). Nine of the 14 positive titers were in dogs, Canis familiaris; were these feral dogs or just free roaming pets?

In no way does the present situation that has been termed a "crisis" since August, 1976, warrant the use of such a highly toxic compound as 1080. Compound 1080 (sodium fluoroacetate) was banned for a good reason because it not only is toxic to the target species, it also indiscriminately kills a wide spectrum of wildlife both directly and indirectly. 1080 is one of the most high controversial substances in the United States with one of the most stringent governmental controls that can be put on a substance. Since there is no known antidote, it simply does not seem reasonable to use such a chemical in an area which has such multipurposes.

The Institute for the Study of Animal Problems and the Humane Society of the United States demand that the use of 1080 continue to be banned on public lands and other alternatives be used for the squirrel problem in California.

1. Evidence is conflicting whether overgrazing will have a significantly greater influence on ground squirrel numbers than will moderate grazing. Any land disturbance, such as Army operations, road building, etc., tend to support larger numbers of ground squirrels.

2. To indicate the area is overgrazed and at the same time suggest the area be burned seems inconsistent since many of the effects on the range forage are the same.

3. Positive serology in the dogs simply indicates that they have been exposed to the plague organism. They are not considered to be carriers of the plague organisms. See response to comment 10, Audubon Society letter, page 310.

4. If the population of ground squirrels on military property continues unchecked while adjacent landowners maintain their squirrel population at low numbers, migrations of ground squirrels from areas of high density to low density is probable. If a ground squirrel control program is undertaken at the Fort Ord Complex, a surveillance, monitoring and testing program should be prepared. Also see page 155.

5. At the 1080 concentrations needed for ground squirrel control (0.05 to 0.08 percent), nontarget losses will be minimal.

7. Zinc phosphide is less efficacious than 1080; therefore, it may be necessary to treat every year instead of every 2-3 years as in the case of 1080. In addition, zinc phosphide presents a greater hazard to pheasants, ducks, geese and other seed-eating birds. Open range control by air is desirable to reduce the large ground squirrel populations which provide constant reinfestations of treated areas.

8. Controlling ground squirrels with rodendicides will undoubtedly put into play various compensating factors just as undoubtedly occurs when predators take squirrels.

9. There are no scientific studies indicating that the squirrel populations are regulated by fleas.

10. Burning annual grasslands would not be feasible if livestock production is to be conducted. Converting grassland to "heavy" trees or to entirely suspend grazing is not feasible.

14. Dogs were domesticated, not feral.

MONTEREY PENINSULA AUDUBON SOCIETY

Statement for Hearing February 24, 1977 on Military Use of Compound 1080
Environmental Impact Statement

Gentlemen:

I am Betty Hughes, of Monterey, president of Monterey Peninsula Audubon Society, representing some 700 members in Monterey and Santa Cruz Counties.

We appreciate the opportunity to comment on the EIS prepared for the Army on the proposed use of compound 1080. A more voluminous environmental report we have not seen. I would submit that there seems to be an excess of unrelated or unnecessary data. I feel sure the framers of our environmental protection legislation, both state and national, did not envision such documents assembling absolutely all the information extant about a given area, whether or not that information was pertinent to the action proposed.

We find many instances in the EIS in which information is distorted or adverse data minimized to serve the ends of the proposed use:

Changed

1 - "Compound 1080 is a rapidly absorbed toxicant. Death usually results in one half to two hours....." (Howard, 1959 - Pg 124)

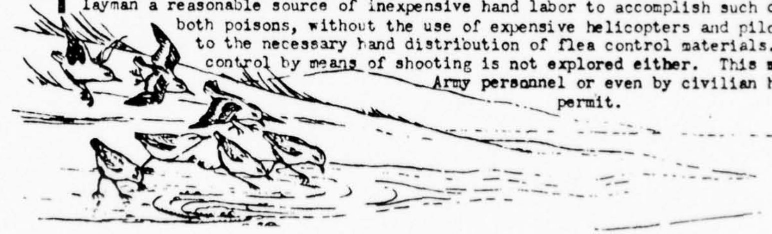
- "Zinc Phosphide.....is a relatively slow acting rodenticide, taking from 30 minutes to 2 hours for death to occur." (Dana, 1962-77, Pg 126) Same time, different slant.

Page 178

2 - Data on 1080 downplays its secondary effects; there is some body of evidence to indicate secondary effects are extremely detrimental to other wildlife, killing off natural predators consuming carcases. A large golden eagle population at Hunter-Liggett could be seriously affected by eating these carcases; there is no indication in the EIS that bodies would be collected and destroyed. The golden eagle is a protected species, if not endangered. Also downplayed in the EIS is the possible effect on the San Joaquin kit fox. These animals frequently change their residence; avoiding "known" dens in poisoning efforts is therefore not sufficient protection for this endangered species. Primary poisoning of seed-eating birds could destroy whole species in the area; dyeing bait is not totally successful in preventing consumption by non-target birds. This possibility is minimized in the EIS.

3 - Diphacinone, by implication, seems also a proscribed poison; this is not so. It is a legal, permitted use, and without dangerous secondary effects. No "emergency" permission would be needed for its use, as it has been and continues to be used on the Fort Ord complex, even being proposed for use around dwellings.

4 - Costs of use of 1080 seem unclear in the EIS; quotes from several areas show quite a degree of difference. However, cost should not be a paramount factor when a poison so detrimental to non-target species is contemplated. Use of Army personnel to distribute both flea and squirrel controls is not even explored, though this seems to the average layman a reasonable source of inexpensive hand labor to accomplish such distribution of both poisons, without the use of expensive helicopters and pilots, in addition to the necessary hand distribution of flea control materials. For that matter control by means of shooting is not explored either. This might be done by Army personnel or even by civilian hunters under permit.



Page 70 5 We find a trifling amount of evidence in the EIS to support the claim of possible plague. One squirrel and a few domestic animals do not an epidemic make. When the Surgeon General himself comments that during 16 months of research, with 1200 rodent bodies being examined, none of them was found with plague organisms, one wonders upon what basis the Army exercised a "crisis exemption" request of EPA "because of an imminent plague hazard which required that Carbaryl be evaluated to control plague vector fleas." (Pg 94) Rather does all the flap about plague bring one to conclude that ground squirrel control - or extinction? - is what is desired, and that Army officials believed a plague scare would permit use of a non-listed poison.

Noted 6 Another factor that is downplayed to some extent is that of over-grazing as a cause of squirrel population explosions. "Multiple use" of public lands apparently means grazing to all federal agencies, except the Park Service. The EIS does not direct enough attention to proper grazing management as a possible curb on squirrel populations. Over-grazing has been noted at Hunter-Liggett since at least 1973, yet it continues, despite protests from citizen groups in the area, and State Fish & Game Department.

7 From material in the EIS, one might conclude there is little evidence of secondary poisoning from 1080; however there is abundant evidence of this in the use of thallium, a similar stable and highly toxic substance, used as is proposed for 1080, broadcast in poisoned grains by air, during which use more than 60 non-target species were killed, among them domestic as well as wild animals.

345 Noted 8 Since the EIS was prepared, the Environmental Protection Agency has begun a year's study of 1080 and its effects in California, in cooperation with state agencies. This will involve pre-poisoning determination of wildlife populations in the study area; radio telemetry tracking procedures both before and after baits are out, retrieval of bodies and scientific analysis of chemical residues by means of a new process recently developed in Denver, reportedly the only reliable test for 1080 residues until now. Watershed effects will also be analysed.

As some definitive information should come out of this study in a year's time, and as ground squirrel populations may be controlling themselves naturally in these drought years, and as proposed control measures cannot be instituted without extensive review which could well take many months and so miss the peak period for baiting, we urge the postponement of extensive treatment of open lands by 1080 until factual data are available from EPA. Meanwhile less toxic controls could be used around buildings and dam structures to minimize squirrel damage.

The Western office of National Audubon Society has authorized me to add its support also to this statement, on behalf of western Audubon Societies.

3. Diphacinone is not without primary or secondary poisoning effects, as is pointed out (see page 134) in the EIS. The problem is not viewed as having great effect on nontarget species so long as it is used on a limited scale. Diphacinone used over large areas would not be without some hazards. Unfortunately there is no past history of large programs on which to fully judge the hazard of diphacinone used for ground squirrel control.

4. The Army has emphasized the fact that the use of Military Personnel is not inexpensive, nor is ground squirrel control the Military mission at Camp Roberts, Fort Ord, and Fort Hunter Liggett. See page 145 regarding shooting.

7. Thallium cannot be compared with 1080 when it concerns either primary or secondary hazards. Thallium was never applied by air for squirrel control.

NPCA

February 21, 1977

Commander
ATTN: Director of Facilities Engineering
Fort Ord
Fort Ord, California 93941

Dear Sir:

The following are the comments of the National Parks and Conservation Association on the Draft Environmental Impact Statement (DEIS) on ground squirrel control at the Fort Ord Complex in California.

NPCA considers the draft environmental impact statement to be inadequate and opposes the proposed action set forth by the Army to reduce ground squirrel populations in this area for the following reasons:

346

1 (1) The Army has not shown that an emergency exists. This must be done to be able to use Compound 1080 on public lands.

Noted 2 (2) Even if there were a threat to human health constituting an emergency, Compound 1080 is neither the necessary nor proper toxicant to provide protection.

Noted 3 (3) The DEIS approaches the action with a biased view (whether intentional or inadvertant) and fails to adequately consider impacts of 1080; the DEIS is more a justification of the proposed action than an objective investigation of environmental impacts and exploration of alternatives.

Pages 93, 155, 156, 157 4 (4) There is little consideration of long-range solutions to the ground squirrel problem.

Each of these points will be discussed below.

Although health officials have concurred that a potential threat to human health exists because of the high ground squirrel population, high concentration of fleas, and presence of plague foci in the area, it has not been shown that this threat constitutes an emergency. The increase in plague cited in the report is too recent to indicate a trend, and has no particular applicability to the Fort Ord Complex area. Furthermore, the results of serological testing of Fort Ord Complex fleas and mammals do not indicate that a plague outbreak is imminent. No plague was found in any of the 31,000 fleas tested and only one squirrel of 817 tested possibly positive for plague.

Although the testing revealed plague in several other mammals, it is impossible to evaluate the significance of this data without comparable statistics from previous years. The fact that the Army wanted to declare an emergency last summer, and yet to date no problem has arisen, indicates that the situation does not warrant designation as an emergency.

In addition, plague is easily treated with drugs such as tetracycline, although it must be quickly diagnosed. Education of the area's populace as to the symptoms of plague would help prevent late treatment. This is not to say that the threat of plague should be ignored, but merely shows that the situation does not qualify as an emergency. Thus, 1080 cannot be used under Executive Order 11870.

Furthermore, even if the situation did constitute an emergency, use of Compound 1080 still could not be allowed under the Executive Order. The Order forbids use of this toxicant unless "any emergency exists that cannot be dealt with by means which do not involve use of chemical toxicants /1080 in this case/ and that such use is essential: 1) to the protection of the health or safety of human life..." (emphasis added). Methods other than the use of 1080 can be used to minimize the human health threat. The DEIS outlines such a program as follows.

The threat to human health can be controlled by reducing squirrel populations in areas of high human use only. This is the policy of the State Department of Public Health (p. 77) and is also stated by the Army in the DEIS. The report includes a chart (p. 121) on the effectiveness of approaches to squirrel control. Reduction of squirrel populations only in high human use areas is rated an equally effective method ("Best overall solution based on present information and proven technology," p. 121) of minimizing human health as reduction of all moderate or high populations on the three military establishments.

Reduction in human use areas does not involve the use of 1080. The proposed action for "Areas of Human Activity" is set forth in pages 146-147. Carbaryl dust is to be used to control fleas, and diphacinone and fumigants are to be used to reduce squirrel populations in these areas. This combination of toxicants is the mehtod currently used to mitigate the threat of plague. Because it is highly toxic and presents such a hazard to humans and their pets, 1080 is proposed for use only in open range.

It appears that the Army desires to use 1080 because it is the cheapest and easiest way to reduce property damage associated with large squirrel populations, not because it is crucial in preventing plague infection in humans.

5 Whether intentional or inadvertent, the report is predisposed to 1080 as the choice chemical. 1080 is described as "a rapidly asborbed toxicant. Death usually results in one half to two hours..." whereas zinc phosphide " is a relatively slow-acting rodenticide taking from 30 minutes to 2 hours for death to occur." On first reading it appears that 1080 kills more quickly and is therefore more humane; in truth it is as "relatively slow-acting" as zinc phosphide. This certainly casts

National Parks & Conservation Association, 1701 Eighteenth Street, N.W., Washington, D.C. 20009
telephone (202) 265-2717

some doubt on the objectiveness of the report,

Furthermore, the DEIS deals inadequately with the impacts of 1080. The importance of the possible secondary poisoning effects on endangered species is not sufficiently discussed and considered.

6 In summarizing long-term effects of the proposed action, the report says "the kit fox is the only rare or endangered species which may be affected." (p. 197) This statement is false. Condors may be affected, and with the viability of the remaining population already in question, the possibility of a further reduction, even one death, cannot be treated lightly. The Cain report of 1964 relates:

> In the fall of 1963 two dead California condors were picked up in an area that recently had been poisoned with 1080 grain to reduce the population of ground squirrel. This operation was conducted by agricultural interests in Kern County, California. The circumstances surrounding the death of these birds and laboratory tests conducted at the University of California on the remains of one of them suggest that the condors died of 1080 poisoning, acquired from eating dead ground squirrels. The condor is a vanishing species and it is unthinkable that this sort of mistake can be permitted to recur.

This concern for the effects of 1080 on condors is reiterated in the 1971 Cain report on predator control. (p. 86)

7 No reason is given for choosing one mile as the protective zone around San Joaquin kit fox dens. One mile hardly seems adequate to protect this endangered species from secondary poisoning, considering the combined movements of the kit fox away from its den and the squirrel or rodent after taking the poison.

Section 7 of the Endangered Species Act of 1973 instructs federal agencies to insure that actions authorized, funded, or carried out by them do not jeapordize the continued existence of endangered species. Because of the threat to endangered species from secondary poisoning, the use of 1080 could, clearly, be in violation of the law.

8 There are further omissions. There is no discussion of the possible effects on the fully-protected golden eagle, which has a relatively low LD_{50}. Golden eagles are known to have been poisoned by 1080 in the past. (See Cain, 1972, p. 72.) It is stated that only 4-6% of the squirrels will die above ground and be available as carrion, but no actual figure is given for how many squirrels this might be. There is no discussion of accumulated secondary poisoning effects; what if the predator or carrion-eater ingests several ground squirrels? And although the report explains that squirrels may take more than the lethal dose of bait due to pouching behavior, the DEIS does not indicate how high toxicant levels in the squirrels' bodies will be.

The report indicates that 1080 will be used every two to three years. An "emergency" request to use 1080 cannot be repeated on a predictable time schedule; this is clearly not in line with the intent of the Executive Order. Long-term solutions to the problem must be investigated. Population dynamics and the efects of grazing on squirrel population levels must be studied separately from the effects of the poisoning.

NPCA suggests the following alternative to the proposed action. This program would significantly reduce the threat to health, reduce damage to crops and facilities, have a niminal impact on the environment, and provide areas for research into long-term solutions. This alternative is substantially similar to Alternative 2 outlined in the DEIS.

Fleas and squirrels should be controlled near areas of high human use. Reducing the host squirrels without reducing the fleas may cause the fleas to transfer to humans or domestic animals. Thus field application of carbaryl should precede squirrel reduction, and the effects of the reduction program must be monitored to insure that fleas are not merely being forced to transfer hosts. Squirrel reduction near human areas would ideally be accomplished by trapping, which the report says can be very selective and effective in small areas.

Destruction of property can be reduced by creating buffer zones around high human use areas and other areas in need of protection from squirrels. Zinc phosphide would be used to initially reduce populations and mechanical methods of burrow disturbance would be tested as a way to prevent squirrels from re-entering the areas.

This would leave large areas of natural populations of squirrels where population dynamics can be studied. The effect of introducing natural predators on squirrel populations would be tested in these areas. In addition, grazing should be studied to determine its role in causing unnatural increases in squirrel populations.

We hope the final report will more extensively consider long-range solutions to high squirrel populations. The discussion of secondary poisoning from 1080 should address itself more fully to possible effects on protected and endangered species. It is clear, however, that the request for an emergency exemption to use 1080 cannot be justified and should be withdrawn.

Sincerely,

T. Destry Jarvis

T. Destry Jarvis
Administrative Assistant
Parks and Conservation

NATIONAL AUDUBON SOCIETY
WESTERN REGIONAL OFFICE
555 AUDUBON PLACE (Fulton near Fair Oaks), SACRAMENTO, CALIFORNIA 95825 (916) 481-5332

March 22, 1977

Department of the Army
HQ, 7th Infantry Division
Fort Ord, CA 93941

Dear Sirs:

Enclosed you will find our comments on the Draft Environmental Statement, Ground Squirrel Control, Fort Ord Complex.

Sincerely,

Glenn Olson

GLENN OLSON
Assistant Representative

GO/sl

Enclosure

cc: Charles Callison
Betty Hughes

AMERICANS COMMITTED TO CONSERVATION

1. The Army contends that an emergency condition exists. See page 83.

2. Both zinc phosphide and 1080 are relatively slow acting compared to strychnine.

6. Information on recent condor sightings in the area, together with the absence of any reports of seeing condors feeding in this region, supports the EIS statement.

7. Even though inadvertent 1080 baiting closer than 1 mile to kit fox dens has not had any observable detrimental effects on the kit fox population, the Fish and Game Department recommends observing the 1 mile buffer zone as an added precaution (Zeiner, pers. comm.).

COMMENTS ON THE

DRAFT ENVIRONMENTAL IMPACT STATEMENT

GROUND SQUIRREL CONTROL, FORT ORD COMPLEX

The Western Regional Office of the National Audubon Society recognizes the need for effective methods to control rodent populations especially when there exists the possibility of infectious disease transmission. The method of control chosen should reflect a high specificity and acute toxicity to the selected target organism(s). The adverse impact of the control on sympatric members of the fauna should be minimized. Rodent control should attempt to identify the environmental factors stabilizing rodent population changes and to modify those identified factors causing population eruptions. This long-range, integrated control perspective was not, we feel, adequately assessed in the Draft EIS: Ground Squirrel Control; Fort Ord Complex, California, (February, 1977). We feel qualified as a nation-wide organization, whose 362,000 members have committed our society to a leading role in the conservation of wildlife and the natural environment, to comment on the impact of the proposed action on the region's wildlife.

1 Most warm blooded species are susceptible to 1080 with carnivores and rodents being among the most susceptible.[1] 1080 has a well-documented potential for primary and secondary poisoning of non-target species of wildlife. In previous rodent control programs, 1080 has killed thousands of ducks, geese, and pheasants.[2] In 1969, a 1080

[1]Environmental Protection Agency, 1080 Information Sheet

[2]M. Schwartz, "Deadly Pesticides in Fresno County", San Francisco Chronicle, (9/13/73)

program to kill Arizona coyotes also killed 34 black bears, 73 badgers and assorted foxes and skunks according to University of Arizona zoologist, Gerald Cole. Dr. Robert Rudd points out in Pesticides and the Living Landscape, "Secondary poisoning, a logical derivative of the chemical's stability became common, and indeed in some instances was hailed as one more demonstration of compound 1080's value."

There is a range of median lethal dose (LD_{50}) values of 1080 which differ for different animal species. This creates a concentration-dependent toxicity which is exploited to selectively kill only organisms in a particular range of LD_{50} values. But as Dr. Rudd has noted, "Extrapolations of laboratory derived toxicity figures to field conditions have ignored the excessive amounts probably taken, stressing only the minimum lethal doses of chemicals. The illusion of safety thereby created very likely conflicts with actual hazards."[3] The EIS notes that most avian predators or carrion feeders are quite resistent to 1080 by reference to the table of comparitive LD_{50} values. However, this assumes nothing about the particular eating habits of the ground squirrel predator; for example, which parts of the ground squirrel are preferred such as the viscera, liver, heart, etc., over fur, bones, which make up a substantial portion of the body weight but which are cast as pellets by raptors. By eating body portions which concentrate poisons, such as the liver, a predator quickly increases his toxic load.

2
Noted

[3]Rudd, R., Pesticides and the Living Landscape, (University of Wisconsin Press, 1966) p. 246.

This effect would be significantly magnified in the canine and feline predators with their lower median lethal dose values. That this actually occurs note the Department of Fish and Game's Pesticide Investigations of January 1, 1972 to June 30, 1973. That report makes mention of the loss of three endangered San

3 Joaquin Kit Foxes in the Peach Tree Valley of Monterey County. The

Noted foxes were found five days after a bait acceptance trial was carried out with 1080 grain baits in an area not previously known to contain kit fox. The EIS, itself (in paragraph three on page 197) notes that the kit fox may experience some loss from eating dead rodents containing 1080. The Audubon Society is opposed to any measure which may further jeopardize the already endangered kit fox.

In the Summary Description of the Action of page X, the report states that "If the ground squirrel population were reduced, the range could support more livestock or desirable wildlife such as

4 deer." However, the range is already considerably overgrazed and the depleted range could not support much wildlife (page 82 comment

Noted of Dr. Leopold). In fact, most vertebrate ecologists feel that high densities of ground squirrels are nearly always the consequences of land disturbances including overgrazing rather than the cause.

In further discussing grazing, the EIS notes on page 39 that studies correlated differences in squirrel populations on areas differentially-grazed:

5

lightly grazed -- 2.7 squirrels/acre

moderately grazed -- 2.3 squirrels/acre

closely grazed -- 4.1 squirrels/acre

The EIS reports that the study showed this not to be a significant decrease. Yet this represents a 45% decrease in squirrel density between closely and moderately grazed areas. We would strongly recommend changes in the patterns of land use be considered as a means of managing the open range ground squirrel habitat at Fort Hunter Liggett and Camp Roberts.

In conclusion, the Western Regional Office of the National Audubon Society supports modifying those environmental land-use patterns such as grazing which have brought about the ground squirrel population eruption. We are opposed to the use of 1080 in

6 control of the ground squirrels on federal lands where the potential

Noted for secondary poisoning exists. We feel that 1080 may secondarily kill those predators of the ground squirrel which naturally control the squirrel population. In effect this would create the need for expanded artificial control in the future.

1. 1080-treated grain properly applied for ground squirrel control has not been demonstrated to cause apparent significant losses of ducks, geese, pheasants, or other species. 1080-treated bait used to control predators such as coyotes, has a long history of killing nontarget species through both primary and secondary poisoning.

5. The original numbers in the article cited indicate a wide variance between populations averaged from study areas.

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March 17, 1977

Col. Charles L. McNeil
Director, Facilities Engineering
Department of the Army
Headquarters
7th Infantry Division-Fort Ord
Fort Ord, CA 93941

Re: <u>Draft Environmental Impact Statement/Ground Squirrel Control, Fort Ord, California (February 1, 1977)</u>

Dear Col. McNeill:

This letter constitutes the comments of the Natural Resources Defense Council, Inc. (NRDC), a nationwide environmental membership organization, on the above referenced document. The subject of the draft is a proposal to control ground squirrel populations within the Fort Ord Complex by means of the aerial application of Compound 1080 to thousands of acres of publicly-owned range lands as well as by other means within areas of human habitation. The goals of NRDC include ensuring that federal statues designed to protect the environment, such as the National Environmental Policy Act of 1969 (NEPA) and the Endangered Species Act of 1973, are fully and properly implemented. In addition, NRDC has had a long-standing interest in minimizing the use of economic poisons such as 1080, because of their environmental effects, and, in 1971, petitioned the Environmental Protection Agency to suspend the registration of four such poisons, including 1080. Accordingly, we wish to take this opportunity to express our concern about this proposal. Moreover, we believe that the draft is deficient in the following respects: (1) it fails to justify the use of this toxicant which has been banned by Executive Order, except

in "emergencies;" (2) it fails to explore reasonable alternatives to the proposed action; and (3) it fails to demonstrate full compliance with Section 7 of the Endangered Species Act.

1 I. <u>The draft fails to justify the proposed use of a prohibited chemical toxicant.</u>

As the draft environmental impact statement (EIS) properly recognizes, the use of Compound 1080, as well as other chemical toxicants which cause secondary effects, on federal lands and in federal programs has been banned since 1972 by Executive Order, except in certain emergency situations. Executive Order 11643 (February 8, 1972). Beyond question, therefore, the instant proposal to engage in the widespread use of 1080 deserves thorough examination by the Army and other federal officials involved as well as the closest public scrutiny.

Executive Order 11643 allows the use of persistent poisons in certain specific situations. It provides that use of a prescribed poison shall be allowed, based on a written finding that:

> "<u>[an] emergency exists that cannot be dealt with by means which do not involve use of chemical toxicants, and that such use is essential:</u>
> (1) <u>to the protection of the health or safety of human life;</u>
> (2) to the preservation of one or more wildlife species threatened with extinction, or likely within the foreseeable future to become so threatened; or
> (3) to the prevention of substantial irretrievable damange to nationally significant natural resources." §3(b). (Emphasis added.)

It is clear that any proposed use of prohibited chemical toxicants must conform strictly to the conditions for emergency use established by the Executive Order, as well as with its stated policy that "where chemical toxicants or devices are used

> [in emergencies], only those combinations of toxicants and techniques will be used which best serve human health and safety and which minimize the use of toxicants and best protect nontarget wildlife species and those individual predatory animals and birds which do not cause damage. . . ." Executive Order 11870, § 1(5) (July 22, 1975). (Emphasis added.)

The primary rationale for the proposal, and for the requested exemption from the Executive Order, is the existence of a public health emergency: the current ground squirrel populations are said to present a serious threat of plague to human beings in the area. (See, e.g., pp. 5,63-78 of the draft EIS.*) Unquestionably, the draft EIS does not pretend that this action is designed to preserve endangered or threatened species. Indeed, it appears that such species may be adversely impacted if the proposal is implemented. (See <u>infra</u>, pp 7 - 9.) Moreover, despite extensive discussion in the draft about the damage caused by squirrels to Army buildings, roads and other structures as well as their adverse influence on range lands, we do not understand the Army to be suggesting that the proposed action is "essential" to prevent "substantial irretrievable damage to nationally significant natural resources."

Thus, to justify the proposed use of Compound 1080, the Army must demonstrate that a public health emergency exists, that it cannot be dealt with except by use of prohibited chemical toxicants, and that the proposed control programs will accomplish this objective with minimum use of toxicants and maximum protection of the environment.

We do not question the need for prompt and effective action

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* Unless otherwise indicated, all page references are to the draft statement.

to reduce or eliminate the cause of a public health emergency within the Fort Ord Complex, if in fact one exists. We do not possess the expertise to determine whether such an emergency exists at the present time within that complex. However, we understand substantial questions regarding the extent of the alleged threat to human life as well as the existence of an "emergency" have been raised by responsible, qualified persons. <u>See</u>, <u>e.g.</u>, the written statement of Betty S. Davis, Ph.D., on behalf of the Sierra Club, submitted at the public hearing on the instant EIS (February 24, 1977). The draft itself, moreover, reveals that there is some question as to the "immediacy" of the emergency. (<u>See</u> letter of Assistant Secretary for Fish and Wildlife, Department of the Interior, p. 100.) In addition, it reveals that <u>no</u> plague organisms were found in over 1,200 rodents examined during 1975 and 1976 or in 31,000 fleas tested. (pp. 112,72.)

Even assuming that a threat to public health exists, we believe that the draft fails to demonstrate that the use of 1080 is "essential" to protect human lives and safety. Indeed, it reveals that the proposed action exceeds the statutory exceptions and that it has been designed to meet additional, unauthorized objectives. As is clear from the draft, the threat to human health presented by ground squirrels and their fleas exists "at the interface between the ground squirrel and humans," i.e., in areas where "there is sufficient and frequent enough human contact with ground squirrels and their fleas to be a human health hazard." (p. 77.) Of course, the proposed action does not involve use of 1080 in such areas because of its toxicity. (<u>See</u>, <u>e.g</u>. p. 1.) In fact, however, the draft reveals that continuation of the Army's current control program, which involves use of diphacinone and carbaryl, is an effective measure for controlling whatever degree of health hazard exists in these areas. Thus, the draft states that "reduction of populations <u>only</u> in high human use areas" is

"the <u>best</u> overall solution based on present information and proven technology" as far as "effectiveness in minimizing threats to human health" is concerned. (p. 121.) (Emphasis added.)

The proposed action involves the use of Compound 1080 on the open range lands. These areas presumably receive little human use, although the draft does not purport to analyze the extent of such use they receive. We do not believe that the draft demonstrates that squirrels on the open range constitute a threat to human health. However, even assuming that squirrels on these lands do present a threat to Human health, it is clear that effective control measures other than Compound 1080 are in fact available to the Army to minimize the threat. For example, official or unofficial quarantines of areas in which squirrel populations are the highest could be instituted in periods in which squirrels are active, or immunization of persons having to enter these areas could be required. (See pp. 65,77,121.)

It is apparent from the draft that Compound 1080 is the control method of choice because it will kill the most squirrels and, as such, presents the most effective solution to <u>all</u> of the problems caused by ground squirrels in the Fort Ord Complex. In addition to the public health threat, the other two problems are "damage to adjacent crop lands" and "damage to military facilities." (p. 120.) We do not dispute the existence of these additional problems, and we recognize that the Army feels a responsibility to do something about them. Nevertheless, we submit that the Army's own policy with respect to poisons having secondary effects as well as the plain language of the Executive Order prohibits their consideration in determining whether an emergency exists which justifies the use of a prohibited chemical toxicant.

The additional problems identified by the draft are in essence economic problems. Clearly they are not problems involving human health, endangered species or nationally significant natural resources. As such, they do not fall within any of the

categories for which exceptions to the Executive Order are authorized. Thus, even if these problems constituted an "emergency" and even if the use of Compound 1080 were "essential" to their resolution, the Executive Order mandates their resolution by methods which do not involve the use of poisons having secondary effects.

The Army's policy in this regard is even more restrictive than the Executive Order. According to the draft, "The Army position with respect to control measures [for ground squirrels and other plague susceptible rodents] is that <u>a threat to human health is the only reason to use toxicants having secondary effects</u>." (December 3, 1976 letter from the U.S. Department of Army Office of Adjutant General regarding Plague Surveillance Program, pp. 109-110.) Thus, the official Army position prohibits the use of Compound 1080 to control those problems for which it is presented as the most effective soltuion.

Accordingly, we submit that the Army must consider the use of other measures to resolve these problems. In this regard, we note that not only the proposed action, but also the alternatives thereto, with the exception of the "no action" alternative, involve the use of the poisons which the draft admits have secondary effects. (<u>See</u> pp. 124, 126.) In our view, NEPA, as well as the Executive Order, require the Army to consider alternatives which do not involve the use of such poisons.

2 II. <u>The draft's discussion of alternatives is inadequate</u>.

Consideration of alternatives has been referred to as the "linchpin" of the environmental assessment procedures mandated by NEPA. <u>Monroe County Conservation Council v. Volpe</u>, 472 F. 2d 693, 697-698 (2d Cir. 1972). The courts have consistently recognized the overriding importance of this element of the NEPA process. They have uniformly disapproved of impact statements in which consideration of alternatives is little more than a <u>pro forma</u> exercise or <u>post-hoc</u> rationalization of decisions previously arrived at in the absence of the environmental impact

analysis required by NEPA.

It is apparent from the draft that the Army intends to do something to control squirrel numbers and minimize the damage they inflict. By restricting the "practical" alternatives considered to programs involving secondary poisons, the draft, in effect, has confused the relationship between NEPA and the requested exemption from the Executive Order. While we agree that "[j]ustification for the use of [prohibited] toxicants and for the declaration of an emergency under Section 3(b) of the Executive Order can and should be determined only after completion of the environmental impact statement process," (p. 98), this does not mean that the Army is entitled to assume throughout the EIS process that an emergency exists and/or that the use of prohibited field rodenticides is justified. The draft, however, makes this very assumption by restricting the "alternatives" considered to those involving such poisons. In essence, the draft considers only alternative ways of carrying out the proposed action, and not alternatives to the proposed action. As such, it disregards NEPA's goals and objectives.

We submit, that the final version of the EIS should evaluate, as an alternative, the use of anti-coagulants, such as diphacinone, applied by hand, in the buffer zones described in Alternative Two, as well as in the human use area. Further, we note that combining this method of control with reduction in numbers of livestock currently permitted to graze the open lands, should result in improvement of current vegetative conditions.

3 III. The Endangered Species Act.

According to the draft impact statement, two wildlife species - the California Condor and the San Joaquin Kit Fox - currently protected by the Endangered Species Act of 1973 are found in the Fort Ord Complex and "must be considered under the proposed action and associated impacts." (p. 159.) However, the draft fails to demonstrate that the Army has fulfilled the obligations imposed by Section 7 of the Endangered Species

Act of 1973.

By its clear language, Section 7 imposes two independent tests for determining the legality of federal actions which may adversely affect protected species. It prohibits actions which "jeopardize the continued existence" of protected species and those which "result in the destruction or modification" of "cricital" habitat areas. In addition, Section 7 requires all federal agencies, including the Army, to consult with and obtain the assistance of the Fish and Wildlife Service (F&WS) in any case in which either of these prohibited impacts arguably may occur.

Unquestionably, the draft reveals that the habitats of the protected species and the species themselves may be adversely affected by implementation of the proposed action or alternatives thereto. (See, e.g., pp. 160, 195, 197.) The draft implies that the Fort Ord Complex does not constitute critical habitat for either of these species. (p. 160.) While this may in fact be true, the draft presents no quantitative or detailed information in support of such a conclusion.

The draft asserts that the Condor "appears to be relatively immune to 1080" and that "[p]resently there is no evidence that condors have ever been killed as the result of 1080 used for ground squirrel control." (Id.) However, given the present low numbers of the Condor population and their habits, it appears to us that this lack of evidence provides no assurance that use of Compound 1080 will not "jeopardize the continued existence of" this critically endangered species.

With respect to the kit fox, the draft asserts that, although the California Department of Fish and Game has concluded that aerially-applied 1080 has not produced any "observable" adverse effects on the kit fox, "as a special added precaution" of the proposed action, "no 1080 bait will be used within one mile of any known kit fox dens." Nonetheless, the draft concedes that "some loss in kit foxes" may result from use of 1080 or zinc

phosphide. Although the draft asserts that these losses "will be minimal" and will produce no long term effect, it does not attempt to quantify the losses which will result. (pp. 161, 197.)

Given the fact that the draft reveals that the proposed squirrel control program and alternatives thereto may affect listed species or their habitats, we submit that Section 7 of the Endangered Species Act requires the Army to immediately initiate consultation with the F&WS. Such consultation is necessary to ensure that the impacts prohibited by Section 7 are avoided as well as that the chance of secondary poisoning of protected species is minimized as completely as possible in any ground squirrel program implemented in the Fort Ord Complex. Moreover, through such consultation the Army will hopefully be able to obtain the kind of detailed information which is missing from the draft regarding the impacts of such programs on the protected species and their habitats. The opinions and recommendations of the F&WS should be included in the final version of this EIS.

In conclusion, we submit that the draft reveals that, even if a public health emergency exists in the Fort Ord Complex, the use of Compound 1080 is not "essential" to its control. We urge the Army to investigate other alternatives to the use of this dangerous poison as required by both the Executive Order and NEPA. Finally, we urge the Army to obtain the assistance of the F&WS in order to ensure that the vital national goals and stringent prohibitions of the Endangered Species Act are fully complied with in any actions undertaken to control ground squirrels.

Thank you in advance for consideration of these comments.

Sincerely,

Johanna H. Wald

Johanna H. Wald

JHW:cec

1. A definition of emergency in the Executive Order is lacking but a threat to human health exists. Waiting until illness or death occurs in humans before declaring an emergency is not appropriate, where intensive control measures are available to minimize or prevent human illness or death. Measures such as grazing control or other range modifications are initially too slow both in implementation and effectiveness.

   Treatment only of areas of intense human use may serve to protect a majority of persons but the large reservoir of ground squirrels in adjacent areas will rapidly re-infest the controlled areas so the problem of infestation and disease will remain.

   It appears that an immediate reduction of ground squirrels is appropriate. It is intended to accomplish this control with the minimum use of toxicants applied in a manner to provide maximum environmental protection. See, also, response to comment number 44 (Audubon), page 310.

2. See in text additional discussion on diphacinone, page 134; trapping, page 143; shooting, page 145; and other management possibilities, page 149 which do warrant further consideration, particularly for possible application after the initial ground squirrel control effort.

3. See response to Department of Interior letters, comment 6, page 291.

LETTERS OF COMMENT FROM INDIVIDUALS:

March 12, 1977
259 Montecito Ave.
Pismo Beach, CA. 93449

CHARLES L. McNEILL
Colonel, CE
Dir. Fac Eng
Office of the Director of Facilities, Engineering
F. Ord, California, 93941

Dear Sir,

This is my response to the Draft Environmental Impact Statement of Febr. 1977 on "Ground Sqirrel Control Fort Ord Complex, California."

Noted 1 — 1. Your proposal to significantly reduce the squirrel population in areas of concern in the three military areas of the Fort Ord Complex is commendable.

Noted 2 — 2. Your proposal as to method is only possible when you effectively set aside presidential or executive order No. 11870 and its subsequent modifications. You do not give any evidence that you have vigorously pursued the application of anticoagulants and Zinc phosphide, namely, Diphacinone and Zn_3P_2, respectively. This procedure, limited unecessarily to 200 yards of occupied structures, would not be unthinkable in cost of application on the areas which you propose to use"1080".

Noted 3 — 3. This non-use of "1080" would materially help to restore a more nearly permanent ecological balance between natural predators and squirrels.

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4 — 4. You propose to use 1080 on a recurring basis as a means of control, thus you intend to preserve for posterity the imbalance which now obtains on military areas and contiguous agricultural areas in both Monterey and San Luis Obispo counties.

5 — 5. You are also proposing a means not deemed wise by Deputy Administrator of EPA, Mr. John Quarles, who, speaking for the Administrator, Russell E. Train via a memo to the Army (p.99) to the effect that "1080" should be avoided unless other means of control are shown to be ineffective. I find that this, the trying of the alternatives, has not been tried, let alone shown to be ineffective. Further, it stated that Diphacinone and Zinc phosphide are expected to be registered in time to effectively dissipate the plague threat in 1977.. Furthermore I personally know and know of farmers in San Luis Obispo County who have the squirrel problem in complete control using Diphacinone only at very much less than prohibitive costs per acre.

6 — 6. The proffered evidence of an immanent plague threat of sylvatic origin has not been very convincing to me. Admittedly a proven plague threat is cause to wish and endeavor to reduce a possible conveyor or transmitter of the plague organism, but sizing up your Draft EIS, it appears to use this possible threat to the hilt in getting at the more obvious origin of the whole instigation of this report in namely, the mitigation of agricultural losses to adjacent farmers of crop lands. That this is true is evidenced by the complaints of farmers and subsequent activities of their active agents, the Commissioners of Agriculture of the affected counties and their County Supervisors.. The human health issue is easily amplified in the public mind and has been used as the prime reason for setting aside the executive order forbidding the use of "1080"

Noted 7 — 7. Balanced ecology for all the living members of the communities involved is the best goal. STRIVE FOR IT.

Most sincerely
Ralph O Baker
Intensely interested citizen

Note to Colonel Charles L. McNeill

Dear Colonel McNeill,

At our last meeting of the Conservation Committee of the San Luis Obispo County Chapter of the California Native Plant Society held Monday March 14, I was asked to include with this letter their wish to include their approval of its contents and virtually their signatures.

However, I am signing it. and do wish it to stand along side the report I turned in at the public hearing on February 24,1977 at Kings City Fairgrounds. I very much wish a copy of the final statement.

Very sincerely
Ralph O Baker
Ralph O. Baker,
259 Montecito Ave.
Pismo Beach, California. 93449

4. Periodic use of aerially applied 1080 bait has not produced observable adverse impacts in San Luis Obispo or Monterey Counties. This repeat treatment has appeared to be satisfactory. There is the possibility of applying other control methods if monitoring the 1080 program or the results of the ongoing EPA Study indicate that there are unacceptable adverse impacts.

5. Diphacinone has been used with success for ground squirrel control, but the costs are high, and the time (days) involved in achieving control are great. Hazards to nontarget wildlife may be as great as if 1080 or zinc phosphide were used.

6. See response 6, 7, 8, 16 and 20 in Charles Callison letter.

Chimney Rock Ranch

PASO ROBLES, CALIFORNIA 93446

20 February, 1977

Office of the Director of
Facilities Engineering
Fort Ord,
California
93941

Attention: Col. Charles McNeill

Subject: Squirrel Control

We are very interested to see your conclusions on the need for controlling the ground squirrels on Camp Roberts. We would point out that this will be an especially bad year for animals leaving the Camp for our ranch, due to the extreme lack of feed caused by the drouth.

Believe us, it has indeed been discourageing to have a neighbor who doesn't do his part in controlling these diseased rodents. We see them just across the property line, thriving and multiplying, and then moving to our clear areas of light population since we have poisoned. Our time and money is wasted to this extent.

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On this ranch we have further concern as we have a 15 family membership recreation club in addition to the agricultural operation. There would appear to be serious exposure here to the plague for these people.

As an ardent conservationist and member of game conservancy groups here and abroad, I see no problem to other wild--life.

1 Noted

After taking advantage of every opportunity to poison, we have an abundance of bob cats, mountain lions, coyotes, hawks, buzzards and eagles. After 20 years observation it would surely appear that these species like a diet of birds, ducks, rabbits, etc., rather than live or dead ground squirrels.

I sincerely hope you will work toward a cooperat--ive program.

Very truly yours,

Harry E. Blythe

Harry E. Blythe, Jr.

PRESENTATION BY

MILDRED BUCHSBAUM

PACIFIC GROVE, CALIF.

1

I am speaking for myself, and particularly because I knew that so many people who came here would be speaking for the wildlife, for which I also have great concern, I thought I would devote myself to the hazards to people -- not only to the ranchers who will be moving around in the areas that will be spread with 1080, but for the certainly toxic effects of any compound capable of killing rodents, which are used in all experimental procedures for testing toxicity to human beings. It is impossible to believe that such a toxin would be harmless to human beings.

And so I am going to make just a short statement that my fear about 1080 covers a great deal of ground. But I feel that we should speak up for those people who would be distributing the poison, who will be clearing up the rodents afterwards, and who will be effected by this fact that the poison will be distributed through the air.

I had another statement to make tonight, but it was directed towards anyone who would get up here and assure us that 1080 was completely harmless to human beings, which is said about many other controversies of this kind that have come up. No one has dared to say that here tonight, and I wonder why, since I thought this was one of the arguments for using 1080.

I would think that the chief value of this hearing this evening is to make certain that, should any toxic effect be shown in human beings after some time has passed, that no one will be able to attend a future hearing and say that this terrible thing that is happening was completely unforeseen, which has been said in so many other cases of this kind.

1. No adverse impacts upon humans have been reported resulting from the use of 1080 for ground squirrel control as described.

Ralph Buchsbaum

183 Ocean View Boulevard, Pacific Grove, California 93950 *Phone: (408) 375-9110*

STATEMENT

24 February 1977. Hearing on proposed plan to control ground squirrel population on the grounds of Fort Ord, Hunter Liggett Military Reservation, and Camp Roberts, California. King City, California.

1. I am Ralph Buchsbaum, a concerned citizen. I am a retired professor of biology, specialist in ecology and author of the textbook: BASIC ECOLOGY (published by The Boxwood Press). I have studied the Draft Environmental Impact Statement prepared by Col. Charles L. McNeill "On Ground Squirrel Control, Fort Ord Complex, Feb. 1, 1977.

1 2. I think that there is not now enough evidence to believe that there is a threat of bubonic plague to justify any action against the ground squirrel population. Should a case of bubonic plague occur, it could have been as likely from a flea bite of any of several rodents other than the ground squirrel. Bubonic plague is endemic in large parts of the West and the incidence of the disease is insignificant. It is likely that there would be more death and injury from automobile accidents and airplane accidents and other activities as a result of the efforts to destroy the ground squirrels than lives saved from the bubonic plague. Bubonic plague is a serious disease but it is easily treated by the prompt use of antibiotics.

3. However, if there is any real need on other grounds than health for the temporary reduction of the ground squirrel population, such as damage to military structures, methods for their reduction should be those least damaging to the ecosystem and ones which need not be repeated over and over again.

4. The main principle that should govern the policy in getting the ecosystem back into a natural balance should be

2 (a) Avoid the use of chemicals such as compound 1080 which would enter the food web and so disrupt the ecosystem by spreading to non-target species. Use biodegradable substances and these in very intense but restrict ways.

3 (b) Avoid upsetting species balance in the natural community. Suddenly reducing the ground squirrel population by killing off 90 percent of the animals will remove most of the prey of the natural predators and cause them to decrease in numbers, thereby allowing the ground squirrels to come back in even larger numbers, thereby requiring an even greater effort. Better to allow nature to recover its own balance and equilibrium. All natural populations tend to occur in cycles of numbers but the system soon brings excessive numbers back to normal.

4 5. In summary: restrict ground squirrel control to local areas immediately affected by their damage by using mechanical means or biodegradable poisons that do not enter the food web. This saves time, money, gasoline, reduces the accident rate, and saves the ecosystem.

Ralph Buchsbaum

1. Consideration must be given to the potential of secondary pneumonic plague developing from the bubonic form. Pneumonic plague is spread from person to person by infectious droplets. The potential for an epidemic is ever present.

   If the disease is not diagnosed in the first 24 hours, treatment may not be effective.

2. 1080 and zinc phosphide are biodegradable to a degree. No registered rodenticides exist that would not present some potential hazards to nontarget species.

3. The effects of artificially reducing the ground squirrels through the proposed action would have no less effect on predators than would occur if plague breaks out in the squirrels.

4. All proven effective mechanical means of squirrel control would be much more expensive, saving neither money, time nor gasoline.

Hearing in King City
February 24, 1977

Comments on E.I.S. for Ground Squirrel Control, Ft. Ord Complex, Monterey and San Luis Obispo Counties, Calif.

As an independent co-producer of educational films on natural resources, I have more than a passing interest in the fate of wildlife predators.

Page 178

1 The use of 1080 in the control of the ground squirrel population will surely result in the slaughter of many other animals as well. Among these is the Golden Eagle. Alternative methods of control are given insufficient attention in the Environmental Impact Statement. With reference to the E.I.S. under discussion, both the Bald and the Golden Eagle are listed as residents in this area. Golden Eagles are listed on P. 38 among the predators of the ground squirrel.

The Golden Eagle as well as the Bald Eagle are covered under the Bald Eagle Protection Act., #16, U.S.C., Sec. 668 - 668-d. It is not only protected under State Law, but under Federal Law as well.

~~Under Sec. 1538, Prohibited Acts, and Sec. 1583~~, ~~Protective Regulations, a "threatened" species~~, It is prohibited to ~~collect, or~~ "take" knowingly or with wanton disregard of the consequences of the act. The term, "take" is ~~further~~ defined to include the use of poison.

2 On the subject of the use of 1080, I feel very strongly or I wouldn't have taken the time and trouble to come here to make this statement. I have read pros and cons about this compound for some 15 or 20 years. There still seems to be a lot of questions about its use. I commend the Army's concern for rare and endangered species as discussed in the news recently about Smith's Blue Butterfly, and Coast Wallflower. It would seem grossly inconsistent to tenderly care for a species of butterfly or a flower, and at the same time use such a "scattergun" tool as the proposed aerial spreading of 1080 which ~~has~~ can have secondary poisoning effects far beyond its original target.

I have grave apprehensions that human error or carelessness will result in gross mishandling of this material...the news is constantly repeating almost daily occurrences of similar accidents and their lethal consequences.

I have become cynical regarding assurances of safety, when safety must compete against cost. I simply do not believe that 1080 can or will be used without the severe loss of wildlife species already dangerously limited in this area.

And finally, I feel a deep frustration and anger that I must come here to protest against the use of public funds to pay for a program I know to be unsound, ineffective, dangerous, and in fact illegal.

Glen Chang

Glen Chang
9105 Palisade Drive
Carmel, Calif. 93921

2. There are no means (poisons or otherwise) by which the squirrel population can be reduced without some minor adverse effects on nontarget species. With the proposed action, these hazards will be kept minimal.

1 Violations by the Draft Environmental Impact Statement, of Feb., 1977, on the Control of Ground Squirrels, Fort Ord Complex, California. of the Guidlines for the Preparation of Environmental Impact Statements as issued by the Council on Environmental Quality
40 CFR Part 1500, 38-FR 20550 (Aug. 1, 1973):

1. Sec. 1500.2 Policy:

"(a) As early as possible and in all cases prior to agency decision concerning recommendations, or favorable reports on proposals for "administrative actions" Federal agencies will, in consultation with other appropriate Federal, State, and local agencies <u>and the public</u> assess in detail the potential environmental impact."

2 However, we find that the Army decided, as of April 23, 1976 (Report on the Squirrel Problem in the Ft. Ord Comples, prepared by the Directorate, Facilities & Engineering, Ft. Ord, California, P. 7, Part 6) to use 1080, by aerial application on Camp Roberts and Ft. Hunter Liggett. This decision was made subseqaent to a meeting at Ft. Hunter Liggett, on April 14, 1976, to which neither the public nor representatives of conservation organizations were invited.

In fact, an effort was made, by the Ft. Ord Office of Public Affairs, to prevent public access to this Report.

Therefore we find the Draft EIS under consideration, in violation of Sec. 1500.2 of the Guidelines;

2. Sec. 1500.2 Policy
(b) (3): "In particular, agencies whould use the environmental impact statement process to explore alternative actions that will avoid or minimize adverse impacts..."

3 However, we find that out of the 271 pages of this Draft EIS exactly 13 pages, pages 125 to 138, are devoted to an "exploration" of alternative actions, of which 3 pages are on zinc phosphide and

3 strychnine, which are comparable to 1080 in their effects on the environment. The whole subject of anti-coagulants, as an alternative action, receives one page. One-half page is given to the alternative of modification of grazing practices, and one-half page is given to the encouragement of natural predators.

Therefore, we suggest that this Draft EIS is in violation of Sec. 1500.2 (b) (3).

3. Sec. 1500.7 (a) Preparing draft environmental statements; public heatings:
(a): "In particular, agencies should keep in mind that such statements (EIS's) are to serve as the means of assessing the environmental impact of proposed agency actions, rather than as justification for decisions already made."

However, even a cursory reading of this Draft EIS establishes that the proposed action, to use 1080, is a "decision already made." The action is constantly described as the only "feasible" action, the only "viable" action. (We forgive Jones & Stokes their misuse of "viable" -- it does have a nice scientific ring.)

We find numerous tables showing us how much less of our taxpayers' money it will cost to use 1080. We find 45 pages, pp. 34 to 79, devoted, in print, pictures, and tables, to showing us the extent of ground squirrel damage to man-made structures and facilities, and to range land, both public + private.

Pages 79 through 193 are an exhaustive description of the proposed action, with frequent use of justifying statements.

4 <u>But</u>, we find exactly <u>thirty-four</u> lines, out of 271 pages, describing the impact of the 1080 action on wild and domestic non-target sepcies, and even here the impact is dismissed as "minimal", "in no case long-term". We are told that "possibly" some non-target rodents and some birds may be lost.

Therefore, we suggest that this EIS is not an assessment of the environmental impact of the proposed agency action, but a justification of "a decision already made" and in violation of Sec. 1500.7 (a).

4. Sec. 1500.8 Content of envionmental statements:

(a) (3) (i): "Primary attention should be given in the statement to discussing those factors most evidently impacted by the proposed action."

5 In view of the obvious fact that the Draft EIS under consideration has given not "primary attention", but the most minuscule attention to "the factors most evidently impacted by the proposed action", which are living creatures, wild, domestic, and human, and given that the proposed action will subject this creatures to exposure to the most lethal poison known, a poison with secondary effect, a poison for which there is no antidote, it seems to us proper to suggest that this EIS is in violation of Sec. 1500.8 (3)(i) of the Guidlines.

5. Sec. 15[illegible].8 (a)(4):

"A rigorous exploration and objective evaluation of the environmental impacts of all reasonable alternative action, particularly those that might enhance environmental quality or avoid some or all of the adverse environmental effects, is essential."

6 We do not find that 13 pages devoted to "exploration" of alternative actions, out of a statement of 271 pages, is a "rigorous and objective evaluation of the environmental impacts of all reasonable alternative ac tions." Therefore, we find that this EIS is in violation of Sec. 1550.8 (a)(4)

6. 1500.8 (a)(6):

"This action whould contain...a discussion of the extent to which the proposed action forecloses future options."

7 Inasmuch as the EIS proposes that "retreatment with aerially-applied 1080 bait may be required every 2-3 years", that "zinc phosfide will be used whenever needed throughout theyear on Ft. Hunter Liggett and Camp Roberts..." it seems evident that the option of a future, poison-free Ft. Ord Complex has been foreclosed... without discussion.

We therefore suggest that this EIS is in violation of 1500.8 (a)(6) of the CEQ Guidelines.

7. Sec. 1500.8 (a)(7):

"Agencies should avoid construing the term "resources" to mean only the labor and materials devoted to an action. "Resources" also means the natural and cultural resources committed to loss or destruction by the action."

8 In view of the accepted concept of wildlife as a "natural resource" which belongs to all the people, in view of the widely accepted view (Dr. Lee Talbot et al) that all wildlife is now in mortal jeopardy, in view of the known facts about the highly destructive character of sodium fluoracetate (Compound 1080), we find the statement on P. 199 of the EIS, that "except for the death of a few animals... "there will be no irreversible or irretrievable commitment of resources other than the consumption of fuel and materials" grossly unresponsive to Section 1500.8 (a)(7),

As do we find the entire EIS in gross violation of the spirit and letter of the National Environment Policy Act, ~~the~~ and the Guidlines established by the President's Council on Environmental Quality.

Submitted by:

Araby Colton

Pamela Ferris-Olson
2488 State Street
San Leandro, Ca. 94577

April 10, 1977

Dear Colonel Charles McNeill;

I have just finished preparing a review of the Ground Squirrel Contrd Draft Environmental Impact Statement for the Fort Ord Complex. I will be presenting this review on Monday, April 11, 1977 for a graduate seminar in ecology. The seminar is entitled, Bio-Ecology of Environmental Impact Forecasting and Reporting and is led by Dr. Howard Cogswell. I realize that the formal deadline for review of this Draft Environmental Impact Statement (DEIS) has been reached, but I understand some individuals have been given extensions. I am a Master's degree candidate in Biology at Calif. State University at Hayward and I feel the Army and Jones and Stokes Associates, Inc. (JSAI) will be interested in my review. I hope you will accept and analyze my comments despite the late date of this communication.

1 As stated in the DEIS the use of Compound 1080 (1080) was banned on public lands by the 1972 Executive Order 11643. This controversial compound at present is on the Environmental Protection Agency's (EPA) Rebuttable Presumptive List and is a restricted material in California. The potential for secondary poisoning of wildlife and its toxicity to man and his livestock and pets has been the reason for 1080 being a controversial method for predator and rodent pest control. The Army's move to have special permission to utilize 1080 may set a precedence for the use of the compound in similiar conditions on public lands and therefore requires careful consideration of alternatives before this proposal should be implemented.

Noted

2 The DEIS lists only three alternatives to the DEIS Proposal. In the first two alternatives there is a dependency on chemicals and the final one is a no action alternative. I believe that JSAI and the Army have overlooked alternatives based on poor assumptions or on a lack of foresight for alternatives other than those requiring the use of chemicals. Unfortunately chemicals for predator and rodent control have been heavily depended upon for control for many decades. This dependence was made quite clear in the Congressional Record, Proceedings and Debates of the 92nd Congress, 1st Session, 117(199), Dec. 17, 1971:

3 "The Division of Wildlife Services has 700 employees who have placed 2,300,000 lbs.-more than a 1000 tons-of poisoned meat on public land in the past 5 years. The main poisons are compound 1080, of which more than 100,000 lbs. has been used annually for 2 decades, and thallium sulfate. A single ounce of compound 1080 at maximum efficancy could kill 200 adult humans. The legal poisoners have also used 3 million strychnine tablets and tons of poisoned grain. Not only has the Interior Department engaged in its own massive poisoning program, but States have subsidized similiar programs by local governments and private organizations, often duplicating and aggravating the destructive impact of Federal programs...
Many of these poisons are not biodegradable. They

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1. The draft EIS reflects the relevant literature and comments available. The draft recognizes the hazards and benefits of the proposed action and alternatives. It further recommends that any action be accompanied by a monitoring and surveillance program to assist in identifying any unforeseen impacts, and further notes that studies of range condition are underway at Fort Hunter Liggett, which will assist in providing management information to be considered as an alternative control measure following initial ground squirrel population reduction.

   Attention has been given to methods other than 1080 and zinc phosphide for immediate reduction of ground squirrel numbers, including target specific action such as shooting, nontarget specific methods such as trapping, and encouragement of natural predators and anticoagulants. These methods have been discussed appropriately with respect to the knowledge available concerning their value at this time.

   There is no action that will not result in an adverse impact of some magnitude to one or more species. The fact remains that there is no hard evidence that the proposed action of controlling ground squirrel population (which has been in use in the same general area for over 25 years) has resulted in significant long-term impacts to any species. The use of 1080 in predator control has resulted in many documented, highly visible and significant impacts upon nontarget species. However, the methodology and impacts of predator control should not be compared or extrapolated to the use of 1080-treated bait applied aerially for ground squirrel control, according to regulated conditions established by and supervised by government agencies.

2. Not relevant to the EIS.
3. See answer to 1.
4. See answer to 1.
5. See answer to 1.
6. See answer to 1.
7. See answer to 1; also see page 168 and 149.
8. See answer to 1.

have a cumulative effect which means that great amounts of poison can accumulate in our food and water supplies."

4 The DEIS discussed the difficulty in getting new materials approved for use and the lack of incentive by private companies to develop control methods. In light of this situation I think the Army should take the initiative in developing methods for rodent control that reduce harmful environmental impacts. The perfect experimental situation prevails at the Fort Ord Complex for the study of alternatives to chemical controls. Instead of spending money for annual chemical applications the Army could invest in programs that are environmentally sound and look at the whole environmental complex and not just one aspect of the situation.

5 Ground squirrel infestations can be used as indicators of disturbed habitat. High populations suggest that there are environmental problems that exist in the area. The DEIS only briefly mentions the relationship between man's alteration of the environment and livestock grazing and ground squirrel density. If the Sacramento Corps of Engineers is shortly to award a contract for the preparation of a range related resource inventory and condition report with management recommendations, I think the DEIS is presumptively presented without this data. I noted on pgs 81(Biswell),82(Leopold, Menke), and 85(JSAI) that there is a good deal of opinion and evidence that the military complex is overstocked and overutilized. If this is the case, the DEIS should have included management of livestock as an alternative for the reduction of ground squirrels.

6 One other comment regarding livestock seems appropriate. On page 79, JSAI refer to outlease grazing programs as an element of natural resource conservation programs on the reservations. I fail to see how the grazing of livestock which changes the variety and numbers of plants in an area and which effects land conditions can be viewed as a conservation program. Livestock are exotics in the California natural environment and compete with native ungulates for food and spread disease to them as well (EG. scabies).

7 In population ecology there are concepts that differentiate control from regulation of animal populations. Regulation is immensely more efficient in that the population stabilizes around some point. In the term control, regulation and stabilization are not inherent. A population can rise to numbers well above carrying capacity of the environment, devastate the local habitat (change flora and fauna composition) before declining to a population low.

The DEIS briefly mentions the concept of population regulation (pg. 186, paragraph 2). The statement made that "if a significant decline were to take place due to disease or other factors, the populations in such areas would recover in a matter of a few years." This does not have to be the case if proper habitat manipulation is employed. One of the major principles of wildlife management lies in habitat manipulation. It is the key tool for wildlife management. If the ground squirrel habitat is less than optimum for the squirrels their numbers will decline. Here again livestock management may be the key.

Noted 8 The drought may play a role in the present high numbers of the squirrels too, but no mention of this interaction appears in the DEIS. Proper management of the land may increase more

desireable native wildlife too. Livestock grazing maintains an environmentally in a low seral stage and thus flora and fauna adaptable to these situations are the organisms found in the area. A change in seres or ecological succession of this area could provide for more abundant wildlife and a fuller wildlife experience on military land.

9 Another comment on the recovery of squirrel populations in several years (pg. 186) is that this is also the case in the situations where rodenticides are used. As early as page 1 the DEIS calls for the use of follow-up treatments with 1080-treated grain every 2-3 years wherever squirrel populations recover or reinvestations occur. The continual use of chemicals will have implications for long term environmental conditions. All wildlife populations affected by the chemicals will be kept low. I think this continual need for chemicals should suggest the need to investigate alternatives to chemicals and the need for alternatives that will reduce the need for continual manipulations. If squirrel numbers can stabilize at lower population sizes the need for manipulations will be reduced and reduce the cost of control and damage. Either the population must be eliminated(impossible due to the constant immigration from surrounding populations and efficiency of present methodology) or there must be a decision to constantly manipulate the populations or reduce populations to a point where natural regulation will keep the population at desireable numbers.

10 Most of the discussion that was involved in the final selection of the three alternatives was based on finances and feasibility. This discussion became misleading. In the early portion of the report(pg. xii) the amount of squirrel damage was given as amounting to over $700,000 per year but later (pg. 197) this amount was given as damage over a 5 year period. In making cost/ efficiency analysis of alternatives, I believe this information should be clarified. Further discussion of costs made the use of hand distributed and mechanical controls appear prohibitive. In the DEIS proposal military personnel would be used to apply chemicals in all but aerial situations. Since this reduces costs to the military, I do not see how other alternatives would have prohibitive costs if military personnal carried them out(see page 130 with reference to methods, trapping through fumigants).

11 The most glaring deficiency in this DEIS is the lack of alternatives presented as feasible for ground squirrel control. The DEIS proposal is a multifaceted one, using several chemicals under each particular circumstance. However, when alternatives were investigated few were a multifaceted approach. Though several techniques may be low in efficiency when analyzed separately, together they can be most effective. Dr. Walter Howard has discussed multifaceted bio-control methods in a reprint from Proceedings of the Third Vertebrate Pest Conference, San Francisco, California, March 7,8,and 9, 1977, pp. 137-157. In Biological Control of Vertebrate Pests he states:

12 "The governing mechanisms incorporated in biocontrol of rodents include predation, habitat manipulation, diseases, and antifertility agents. Biological control of vertebrates is applied ecology, i.e., it is the regulation of population levels, not necessarily the destruction of individuals. Actually,

12 all animal , even "conventional" methods of vertebrate pest control, should be based on a prudent translation of the ecological laws of nature into an effective management policy. Unfortunately, vertebrates are relatively long-lived, so troublesome populations usually cannot be tolerated until they die of natural causes due to some biological control procedure. Therefore, the greatest likelihood for effective application of biological control of existing pestiferous rodent populations is by means of integrated control, where biological control is done concomitantly with an initial population reduction produced by some conventional method.

Biological control of a rodent pest implies an effective reduction in density of the pest which has been caused by man intentionally modifying certain biotic elements of the pest's environment. If successful, the induced biotic reduction of the population will produce economic control by reducing the pest's density below the economic-injury level to the economic threshold, where, should the population density start to increase, there would be"sufficient time for the initiation of new control measures and for these measures to take effect before the population reaches the economic-injury level"(Stern *et al.* 1959)...

When one is willing to accept ecological consequences, many kinds of rodent pest problems can be largely alleviated by modifying the conditions of the habitat. Support for this statement is the fact that the most important factor determining the presence of animals in a given locality is the suitability of the habitat to the species in question...

Even though more information about antifertility agents is required before widely applied, it looks like a promising field. A combination of sterilants and conventional control methods would probably produce synergistic effects(the degree of control methods would exceed the sum of the independent effects of each method)."

Therefore a combination of techniques listed on page 140 can be used with low adverse environmental effects and with high effectiveness in alleviating the problem.

13 A major consideration in reviewing a project other than feasibility and economics is commentaries. It is important to look at what feasible suggestions have been given and the expertise of the commentator. The lack of personal commentary in the DEIS limits this aspect of review. I felt the summary of positions on the squirrel problem was poor.

14 I think that the DEIS shows a leaning to stick with prescribed chemical methodology as the easy way out. However, it is not an easy out as it is a plan that will be costly when viewed as a program requiring continuous application. There has been no attempt to discuss ecological principles in relation to ground squirrel management. Since the Proposal is outlined in a DEIS I feel that it is inappropriate to overlook ecological considerations other than those related to the impacts of chemicals to be used. The present dependance on chemicals is appalling. With all that is known about population ecology, it is incredible that thousands of tons of chemicals are used annually to try and correct environmental imbalances. This methodology generally continues the problem rather than solves it. Pollution and the ability of many pests to adapt to chemical controls and thus their firmer establishment in a habitat over native species suggests that chemical controls are not really

15 feasible alternatives. The knowledge is at hand for pest control but the technology has been poorly investigated. The Fort Ord Complex could be an experimental area for these techniques and thus do the public a great service by finding more feasible, low cost, and environmentally sound programs for pest control. I hope the military can take this challenge and do the public a great service beyond the local reduction of ground squirrels.

Noted

Sincerely,

Pamela Ferris-Olson

Pamela Ferris-Olson

cc: Jones and Stokes Associates, Inc.
Director, Environmental Protection Agency
Dr. Walter Howard

2. The dependency on chemicals in this situation is necessary because other proven methods (i.e., shooting and trapping) of rapidly reducing the squirrel population are at least 20 times more expensive and very labor-intensive approaches. Neither method is without some hazards to nontarget species.

3. This quote is in reference to predator animal control with 1080 treated meat bait and has little, if any, relevance to the proposed action.

4. The U. S. Fish and Wildlife Service maintains a central laboratory in Denver, Colorado for the investigation of field vertebrate pest problems and solutions to these problems. The researchers attached to that group are actively studying solutions to the squirrel problem. For the Army to duplicate these efforts would be unsound administration.

5. Ground squirrels are found in many places where the habitat is not disturbed by man or his livestock. Management of livestock may prove to be an acceptable alternative for long-term control of ground squirrel population, when results of the range study now underway at Fort Hunter Liggett are obtained and analyzed.

6. Range forage is a renewable resource which can be utilized by man for grazing livestock (i.e., food production). Much of this forage is lost each year if not used.

7. There is little evidence that man has ever intentionally altered the habitat as a sole method of reducing squirrel populations and achieved a balance where squirrels caused no economic damage and were below a level of public health importance.

9. The use of chemicals for the control of squirrels over the long run may be far less detrimental to other wildlife species than attempting to manipulate the environment to reduce squirrel numbers.

   Ground squirrel control measures other than 1080 may be appropriate as the ground squirrel population recovers from initial high reduction. These measures would be evaluated at the time with respect to information developed during the present range studies by the ongoing Environmental Protection Agency study, other research, or data gathered through monitoring other ground squirrel control programs (see page 155.

10. Additional information on the cost of using other alternatives has been added. Crop damage estimates are correctly reported as $700,000 for the period of 1972-1976.

11. It is impossible to adequately cover all of the potential combinations possible in the EIS. Only the key major alternatives were discussed, but the use of these would not exclude the use of trapping, shooting, fencing, etc. if these methods were the best solution in any given situation. See page 143 and response to comment 10 above.

12. The quotation by Howard (1967) is noted and another passage in this article seems most appropriate. Howard (1967) states: "Any habitat manipulation that effectively reduces the troublesome status of a population of vertebrates will most likely alter the entire ecosystem, i.e., effect the species composition and density of all other kinds of vertebrates and invertebrates living in that ecosystem, far more drastically than could result if the same degree of control was achieved by some relatively selective 'conventional' control method."

13. The intent of the EIS is to assemble facts and information for use in a decision-making process.

14. The state of the art of squirrel control necessarily must rely heavily on chemical methods where rapid reduction of populations appear necessary. The range studies and the plague surveillance program now underway at the Fort Ord Complex may provide the basic material for design and implementation of new ground squirrel control measures at the Fort Ord Complex.

JANIE FIGEN

I wish to make a few comments concerning the procedural aspects of the present effort to justify the use of 1080 on the Ft. Ord Complex.

(1) No one seriously questions the fact that 1080 is a secondary poison prohibited by Executive Orders No. 11643, dated Feg. 8, 1972, and No 11870, dated July 18, 1975.

(2) Said orders clearly prohibit the use of a secondary poison unless the following conditions are met:

a. An emergency exists,

b. The emergency cannot be met by any other means than by use of a secondary poison,

c. The emergency involves

(i) protection of human health, safety, or life, or

(ii) preservation of endangered species, or

(iii) preventing irreparable harm to significant natural resources.

Everyone agrees that to qualify as an exception to this order, the ground squirrel problem must be categorized as an emergency involving a threat to public safety. However, a careful examination of the procedures followed in the 1080 program, and the documents published by the agency involved clearly demonstrates that this 1080 program fails to meet the exceptions of the Executive Order.

1 (3) First, there is the question of the so-called emergency. In the Environmental Assessment, dated April 28, 1976, prepared by Jack V. Massera, and approved by Col. Charles L. McNeill, the Army states dategorically that:

"b. The Ft. Ord Complex cannot comply with the...provisions of the Executive Order,

(1) An emergency does exist...This emergency (economics) however is not covered in the Executive Order,

(2) The health and safety of human life is of definite concern, however an outbreak of contagious disease transmittable to man has not occurred, and thus a health emergency cannot be declared."

(4) However, a reading of the Draft EIS prepared for the same agency just a few months later leads the casual reader to the conclusion that to protect ourselves from the plague we must immediately erradicate the ground squirrels.

2 (5) I regret to say this, but this suddan reversal of position cannot lead one to any other conclusion than that the "plague issue" is now being raised to justify an action that cannot otherwise be justified. Whereas in April you were talking of using 1080 to solve an economic emergency you now state (EIS-pg. 110) that the only reason you want to use a toxicant with a secondary effect is the threat to human life.

3 (6) Earlier, I noted that a "casual" reading of the EIS leaves the reader with the impression that unless the squirrels are killed we face the danger of an outbreak of plague. A careful reading of your own report reveals that plague is, at best, a possibility.

4 Noted (7) Pp. 63 - 78 deal with the plague issue in some detail. However, all that is actually said is (1) that anytime you have flea bearing rodents you have a potential for plague, and (2) that ground squirrels are flea bearing rodents, and therefore the Ft. ~~Ord~~ Ord Complex may have a potential for plague. This statement can

be made about almost any place on the face of this earth where man resides. This fact does not constitute evidence of an emergency health hazaard to human beings.

(8) One very interesting aspect of the EIS with respect to the plague is the description of how the plague might be passed from squirrel to man. Specifically, it is noted that if a squirrel died of plague the fleas on it would find a new host and that host might be a human being.

5 Question, will not the masse extermination of squirrels leaving millions of fleas without a home create an even worse situation? Common sense would seem to indicate (based on your own EIS) that manual poisoning coupled with flea eradication is mandatory if we are to be safe from the plague.

6 Noted (9) Other evidence of the fact that there is no real emergency is found in your report. For example,

"The plague will still remain in other rodents even though the ground squirrels are all killed." P. 74;

"No plague has been reported...concerning the 31,000 fleas ...taken from California ground squirrels." Pg. 72;

7 (10) With respect to the emergency standard required by the Executive Order, your EIS falls far short of demonstrating any such situation. In fact, one has trouble finding anything more serious than a potential for harm similar to that which underlies all human activity.

(11) Another aspect of the Executive Order is that there be no other possible remedy for the emergency than the use of the secondary poison. Here again the EIS stands as a bar to the use of 1080. See pps. 176-188.

Noted 8 (12) In conclusion, one can only return to the propsition that

8 Noted "plague" is being raised to justify the use of 1080 for the so-called economic emergency. It seems as if minds are already made up, and all that remains is to come up with the means to justify the ends. However, even with respect to this "economic emergency", questions arise. You apparently rely, without substantiation, on reports from the persons who are using their losses to justify this program. It is worth noting that the persons who prepared the EIS observed no crop losses. Again, one cannot help but wonder.

(13) The purpose of this report is supposed to be to give the Army an opportunity to evaluate the fact, and make a decision. Instead, the opposite appears to be happening. Within the past few days at least one Federal Court has intervened to stop oil drilling for a similar reason. It is hoped that the same type of action will not be needed here.

1. The general consensus presented in the Environmental Assessment, dated April 28, 1976, was that an economic emergency existed which could be attributed to high ground squirrel density; however, since that time monitoring of the rodent and predator populations has produced serological evidence of plague foci on military lands and adjacent property (letter from Surgeon General, dated June 11, 1976). The Director of the Department of Health, State of California (June 30, 1976) states that rodent-borne diseases will inevitably enter the highly susceptible ground squirrel population and urges that actions be taken to assure the protection of human health. The rationale for the determination that a public health threat does in fact exist has been presented by the Surgeon General's Office (memorandum dated August 17, 1976).

2. A threat to human health takes precedence over any other threat (i.e., economic threat), therefore, the use of the most efficacious rodenticide available would seem to be in order.

3. Plague is a possibility.

5. If plague infested fleas are found, flea control and quarantine would be mandatory. The suggested effort is to reduce the squirrel population <u>before</u> a plague infection occurs.

7. See response number 1.

18 Paseo Tercero
Salinas, Calif. 93901
March 14, 1977

Director of Facilities Engineering
Headquarters 7th Infantry Division
Fort Ord, Calif. 93941

Dear Colonel McNeill:

I should like to submit the following comments supplementing my statement made at the Public Hearing for the Draft Environmental Impact Statement for Ground Squirrel Control, Fort Ord Complex, held at King City on 24 Feb., 1977 (Announcement AFZW-EE dated 1 Feb. 1977). The statements made at the hearing fell into two general categories: those opposing the proposed action on the ground that the use of Compound 1080 was not justified; and those supporting the proposed action on the ground that ground squirrels cause unacceptable damage to adjacent agriculture. These two positions are not in opposition. Few if any of those opposing the action objected to reasonable measures for ground squirrel control, and I heard no contradiction of the claim that ground squirrels do cause damage. The issue is whether or not a serious crisis exists that requires the use of agents having a secondary poisoning effect. The comments at the hearing indicated no good reason for such use. The following paragraphs indicate areas in which the EIS appears to me to be deficient.

1 [A] I cannot find in the EIS any justification for an emergency exemption to the provisions of Executive Order 11870 to allow the use of 1080 on the open range. Squirrels on the open range do not pose a health hazard to humans, since the plague reservoir is in rodents other than ground squirrels. In case an outbreak occurs on the open range, the presence of sick or dead animals serves as a warning of the disease. The position of the California Department of Public Health (pp. 76-77 of the EIS) is that their work is easier if ground squirrels are not poisoned. On p. 97-99, the Council of Environmental Quality found no emergency justification for the use of 1080 or of DDT for fleas; and the EPA advised against the use of 1080 unless other means are shown to be ineffective. The Army apparently heeds these recommendations in areas where there is human use and a possible health threat, yet seeks an exemption from the Exec. Order 11870 in order to use 1080 in areas where human health is not the issue, contrary to the stated Army official position (p. 110) that "a threat to human health is the only reason to use toxicants having secondary effects."

2 [B] On page 124, the EIS cites Koford, 1953, as one of the authorities for the statement that "Raptors and scavenging birds apparently are seldom affected" by compound 1080. This is

a misleading conclusion from Koford's paper. On page 131, following a discussion of feeding experiments with eagles and vultures (presented in this EIS), Koford says, "Perhaps, then, the use of Compound 1080 is less dangerous to condors than the use of thallium. Again, however, the physiological effect of sublethal doses of this poison over a long period might well be harmful to condors." In his previous discussion of thallium, he states on page 130 that, based on experiments reported on raptorial birds by a government official (unidentified), "it is probable that some condors have acquired a lethal or near lethal dose of thallium." These statements certainly do not lead to the conclusion that the condor is seldom affected by 1080. The extremely small number of condors alive and the rugged country in which they live make it unlikely that a dead bird would be found under circumstances which would link its death to ground squirrels killed by 1080. Yet such cases are known, as mentioned in my original statement, page 4. The very precarious status of the condor population makes the possible loss of even one bird a serious threat. For this reason, the use of 1080 should not be considered where there is any possibility whatever that secondary poisoning of condors might occur. Koford, in his final paragraph on the subject (p. 138) says "Carcasses of poisoned animals must be regarded as dangerous to condors until they are proven otherwise."

Changed, page 129 2

Noted 3

[C] I formally propose an additional alternative plan of action to be considered for the solution of the ground squirrel problem:

1. In areas of human use, control measures as in the proposed action.

2. Establish a buffer zone adjacent to private agricultural lands, in width 1/2 to 1 mile (to be determined by additional study), in which grazing is permanently prohibited in order to modify the habitat to make it unsuitable for ground squirrels. Within the buffer zone, reduce the population initially by fumigants and ground application of zinc phosphide in the vicinity of burrow concentrations.

3. In other areas of the open range, no control by toxicants will be employed, except that in special areas (dams, roads, etc.) methods similar to those employed in areas of human use may be employed only when and where damage is evident. Concurrently, grazing should be reduced to allow the range to recover.

This alternative plan accomplishes the objectives desired by both nearby ranchers and those opposed to 1080. It provides

William J. Francis P. 3

3 essentially permanent removal of the infiltrating ground squirrels so strongly objected to by the adjacent landowners. It eliminates the use of Compound 1080 entirely, and sharply reduces the adverse effects on the ecosystem that would be caused by the proposed plan of action. From the point of view of grazing lessees, it has a negative effect in reducing available grazing acreage; I believe this is a fair trade-off for the benefits to be had by halting infiltration of squirrels to adjacent lands. The lessees have no vested right to grazing on federal lands, and some restriction of grazing is a small price to pay for reduction in ground squirrel damage if it is as great as was indicated at the King City hearing.

4 Total cost to the Army I believe will be reduced, although I do not have data to make an actual computation. Cost of aerial application will be eliminated, costs of toxic agents will be much reduced; on the other hand, the revenue from grazing leases will also be reduced. Since a part of the lease revenue should be charged against the range deterioration that grazing has caused in the past, I believe the true revenue loss will be considerably less than the savings achieved by the elimination of the aerial applications of poison. *The final Environmental Impact Statement* should provide data to assess these costs.

Thank you for the opportunity to express these views.

Very truly yours,

W. J. Francis

WILLIAM J. FRANCIS, Ph.D.
18 Paseo Tercero
Salinas, CA 93901

1. High squirrel populations with high flea counts on the open range do pose a hazard to humans whenever the plague enters their populations, and personnel such as troops on maneuvers are in the area in question. Ground squirrels may be useful indicators of plague; however, human exposure to plague may have occurred before the required ground squirrel program can be implemented.

4. Data are not available to indicate what losses may have resulted from alleged range deterioration due to grazing.

STATEMENT ON THE DEPARTMENT OF ARMY DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR GROUND SQUIRREL CONTROL, FORT ORD COMPLEX, MONTEREY AND SAN LUIS OBISPO COUNTIES, CALIFORNIA. PRESENTED AT THE PUBLIC HEARING HELD ON 24 FEBRUARY, 1977 AT KING CITY, CALIFORNIA, BY WILLIAM J. FRANCIS, PH.D., 18 PASEO TERCERO, SALINAS, CALIFORNIA.

My name is William Francis, and I am a retired Wildlife Ecologist, formerly employed as a Research Biologist with the U.S. Fish and Wildlife Service in the Section of Animal Depredations Control Studies. I have carefully studied the Draft Environmental Impact Statement (EIS), and I would like to submit the following comments on certain points which I believe are crucial to the adequacy of the statement.

1 My first point concerns the justification for the use of Compound 1080 (Sodium monofluoroacetate) on the open range at Fort Hunter Liggett and Camp Roberts. An exemption from Executive Order No. 11970 is sought on the grounds that a threat to *Public Health exists in this area*, and therefore the use of 1080 is necessary. The proposed plan of action, however, is to use 1080 only on the open range and not in areas of human activity. The reservoirs of infection for sylvatic plague in the Fort Ord complex is in rodents other than ground squirrels, and therefore the elimination or reduction of ground squirrels on the open range will have no effect on the incidence of plague foci. The threat from ground squirrels is only in the possibility of infected fleas leaving the ground squirrels for human hosts in case of an epizootic among squirrels. But since 1080 is not to be used in areas of human activity, essentially no reduction in this threat will be attained by using 1080 on the open range where the chance of fleas reaching human beings is minimal. The letter of Dec. 3, 1976 from the Army Office of the Adjutant General (pp. 109-110 of the EIS) specifically states that "a threat to human health is the only reason to use toxicants having secondary effects." Such a threat has not been shown to exist in the areas where it is proposed to use 1080, and therefore there is no adequate reason to grant an exemption from Executive Order No. 11970.

2 Second, I would like to comment on the choice of 1080 over zinc phosphide because of its greater efficacy. The EIS declares that 1080 must be used because it is 90% effective, while zinc phosphide is only 60% effective. (As discussed above, this argument is inconsistent with the proposal to use zinc phosphide in areas where humans are more likely to be exposed to ground squirrel fleas). A statement from Storer and Jameson, 1965 (p. 35 of the EIS) is quoted to the effect that "unless 90% are eliminated in a given year there will be no general reduction in numbers". This statement is simply ecological nonsense in the context in which it is used. I checked the reference cited and found it to be a California Agricultural Experiment Station circular in which the quoted statement is made with no data of any kind to support it. It is definitely not a scientific finding. 3 The source of the 90% figure was most probably a calculation based on reproductive rates. If the average litter size is 8 (EIS p. 35), then 100 pairs of ground squirrels would produce 800 young to make the total population 1000; 80% must die during the year if the number is to be reduced to the original 200, or 90% if the population is to be halved to 100 animals. To reason that we must therefore use a poison that kills 90% of the animals is totally false; it ignores completely the ecological reality that, on the average, as many squirrels will die of natural causes as are produced each year. Even during periods of rapid population increase, a substantial number of squirrels will fall victim to predators, accident, and disease every year. When the population is high and possibly exceeding long-term carrying capacity, as is alleged to be the present situation, it is to be expected that additional deaths from starvation and increased incidence of disease (e.g., sylvatic plague epizootics), will raise the mortality rate higher than the reproductive rate and the population will decrease. The assumption that only control by poison will keep population in check would mean, in the example just given, that with no control, the original 200 animals would increase to 1000 in one year, 5000 in two years, and eventually to 625,000 in five years. Obviously this has not occurred in the five years that no control has been carried out on the Fort Ord complex. There is no justification for using 1080 in preference to zinc phosphide on the basis of its presumed 90% effectiveness. If the EIS

is to provide a meaningful estimate of the percentage of ground squirrels that should be killed to achieve its objectives, it should present the scientific data to show actual survival, mortality, and population changes which occur naturally under various conditions.

4 Third, I would like to question the advisability of introducing extremely toxic poisons, with known secondary poisoning effect, into an ecosystem. Aerially applied poison baits spread over the range will not affect only the "target" ground squirrels; it will affect probably all rodents, some birds, carnivores and scavengers, and many of the invertebrates, all of which are functional parts of a complex system. The elimination of any one species can be brushed off as of "minor" importance. The cumulative effect on many species will almost certainly affect the ecosystem in important and probably unpredictable ways. Previous human efforts to alter ecosystems in a way intended to benefit humanity have a notable record of failure, almost all discovered after it was too late to reverse the process. The present proposed action is aimed at altering the ecosystem to one in which ground squirrels are appreciably reduced. It makes little if any attempt to show what the resulting ecosystem would be like. I would confidently predict that the overall result would leave the ecosystem in worse condition than it is now, considering all aspects. Although this is a statement of faith, if you like, I believe most ecologists would agree with me. 5 The only reasonable course of action I can see is to limit control on the open range, as elsewhere, to direct treatment of concentrations of squirrels, avoiding all broadcast of toxic agents.

The above three points lead me to the conclusion that a ground squirrel control program should not use sodium monofluoroacetate (or similar compounds) under any circumstances; no poisons should be spread by aerial application; and control measures used should be those that can be directed solely and specifically to ground squirrels and their insect parasites.

In addition to the above major points, I would like to present data on two additional matters of which I have personal knowledge, not given in the EIS.

6 The EIS states on p. 160 that "there is no evidence that condors have ever been killed as a result of 1080 used for ground squirrel control. In 1963, when I was at the Museum of Vertebrate Zoology at Berkeley, the carcass of a dead Condor was brought to the museum. This condor had been found dead by a crew that was applying 1080 bait for ground squirrel control in Kern County, and eventually found its way to the museum in a very poor condition. In the process of salvaging the skeleton, the skull was placed in a colony of dermestid beetle larvae for cleaning. All the larva were found dead the following day. The skull was further cleaned by hand and with a hot cleaning solution, then placed in a second colony of dermestids. Again, all the larva were found dead the following day. A laboratory test on the dead larva failed to reveal the toxin responsible; tests at that time were not sensitive enough to detect minute traces of 1080. Dr. Robert L. Rudd advised that the death of the larvae was the best test of the presence of toxins, although the precise poison could not be identified. However, the carcass was found in an area where 1080 had been used for ground squirrel control. Dr. Alden H. Miller discussed in detail the problems of condors and agricultural poisons in "The current status and welfare of the California Condor", Research Report No. 6 of the National Audubon Society, 1965, including a description of the incident here discussed (pp. 36-43). He reported two other dead condors found in the early 1960's with no evidence of accident or shooting, suggesting the possibility of poisoning. Under the circumstances we must consider the risk of condor poisoning to be very real; loss of even one bird in this extremely endangered species could be the final blow leading to extinction.

Noted 7 The section of the EIS on ground squirrel damage suggests (p.63) that ground squirrels may have an adverse effect on quail populations, although admitting that the evidence is conflicting, and that the quail decline in 1975 may have been due to dry weather conditions. I conducted research on quail populations in 1963-1965 in several locations, including Hunter Liggett. For an area in San Luis Obispo County, I found that 98.8 % of the variation in population, during 14 years for which data were available (including two exceptionally dry years), could be accounted for solely by weather conditions and the age structure of

the quail population. Only 1.2 % of population changes remained to be accounted for by all other factors, including ground squirrels. That ground squirrels are of no importance to quail populations is to be expected, since quail behavior and clutch size have evolved in a system which included ground squirrels. Most predation by squirrels, like predation by accipitrine hawks or bobcats, has always been a part of the normal functioning of the system. I have attached an abstract of
8 this research; fuller discussion may be found in "The influence of weather on population fluctuations in California Quail", W.J. Francis, 1970, Journal of Wildlife Management 34(2): pp. 249-266.

I hope these comments may assist in developing a Final Environmental Impact Statement which will eliminate the hazards caused by using compound 1080, and will also protect the ecosystem against serious impact on non-target species of birds, mammals, and invertebrates of many kinds.

1. The open range areas will include large numbers of military personnel on field maneuvers (including bivouacs) and who may thus be exposed to fleas. The ground squirrel populations on open range would reinfest treated areas around bivouacs and cantonments.

2. The statement from Storer and Jamison (1965) was cited only to point out that a considerable reduction is needed (i.e., 90 percent) before any appreciable effect is made on the population as a whole.

   Zinc phosphide is suggested for use in some of the smaller areas and if poor results are obtained, then the use of fumigants or anticoagulants to follow up zinc phosphide would not be too costly in money or time.

3. While it is recognized that natural factors keep the population from increasing at the maximum rate, these factors have not been sufficient to keep the population down to reasonable numbers.

4. The ecosystem at Camp Roberts has been modified by human activities. Even if 1080 were not used, this would not return the area to a pristine natural state.

5. Control on the open range <u>is</u> limited to treatment of concentrations of ground squirrels. Bait is applied <u>only</u> in dense ground squirrel colonies. See page 160.

6. To date there is no hard evidence linking 1080 to condor deaths.

8. It is agreed that predators which have evolved with their prey rarely have any major impact on their prey population. This is why the predators on the Fort Ord Complex do not keep the squirrel population low.

HERBERT H. LEHMAN COLLEGE
OF THE CITY UNIVERSITY OF NEW YORK

BRONX, NEW YORK 10468

INTERDEPARTMENTAL
LINGUISTICS PROGRAM

(212) 960-8400
March 8, 1977

Mr. Bruce A. Hildebrand,
Deputy for Environmental Affairs,
Office of the Assistant Secretary of the Army
Dept. of the Army,
Washington, D.C. 20310

Dear Mr. Hildebrand:

In reply to your letter of January 31, 1977, I hereby submit my comments on the adequacy of the Draft Environmental Impact Statement pertaining to proposed control of ground squirrels in California.

My opinion, after careful perusal of the document, is that the case for a waiver of Executive Order 11643 (1972) is very weak. I find the Draft EIS to

374

i) be lacking in information on several crucial points;
ii) contain several (perhaps only apparent) contradictions;
iii) ignore at least one obvious alternative course of action for solving the problem.

I shall deal with the points in order.

1. Missing information.

1 Page 87 a) The Draft EIS does not indicate how great the revenue from grazing leases is. It is clear that excessive grazing aids the increase of ground squirrels (p. 39) and that excessive grazing has taken place on the military land (pp. 81, 82, 99). It is not impossible, thus, that the request for permission to use 1080 may be ultimately motivated by the desire to increase the grazing revenue. In that case, ground squirrels and non-target species would be poisoned in order to make money for the Army by grazing.

b) It is claimed (p. x) that grazing on military lands is necessary to prevent fires. No information is given as to how low a level of grazing is compatible with fire safety. (See p. 30 for connection between close grazing and high ground squirrel density.)

2 Page 48 c) Does the ground squirrel have any natural predator? It is surprising that no predator should have profited from the ground squirrel population explosion in the military complexes.

2. (Apparent?) contradictions.

3 a) It is claimed (p. 74, p. 122) that the [illegible] for [illegible] [illegible] out among the ground squirrels; however, control action by means of 1080 will be carried out on the range. The most effectively killed ground squirrels will thus

be those which compete with the livestock, not those which are about to release their fleas on the baseball field.

4 b) The existence of an emergency involving risk to human health is a necessary condition for waiver of E.O. 11643 (p. 4), but such an emergency is nowhere proven; all that has been argued is that there is danger of a plague outbreak among the ground squirrels (p. 74). One is reminded of the swine-flu scare. Even more significant: the Army proposes to reuse 1080 every two or three years (pp. 151, 154). This suggests that the "plague emergency" is being used as an excuse for permission to use 1080 on ground squirrels as a regular control device. Something that recurs every two or three years can hardly be an emergency. What is apparently sought is permission for the Army to combat ground squirrels with the same weapons as are available to private landowners.

5 Noted c) One of the benefits (hardly a "national defense consideration", as claimed on p. 201) to be derived from the use of 1080 would be the savings resulting from reduced damage to crops on private lands abutting on the Army complexes. The 1080, however, would be used on federal land, maintained by the tax-dollars of all citizens. The net result of the operation would be that private ranchers and crop growers would be subsidized at the expense of the taxpayer and of the wildlife on Federal land.

3. An alternative ignored by the Draft EIS.

The three alternatives listed (pp. 177-195) are remarkably unimaginative, in that they

i) boil down to using poison or doing nothing;
ii) do not attempt to go to the root of the problem, i.e. what is the cause of the excessive ground squirrel population?

6 Noted In particular, no attention has been given to the possibility of a multi-faceted approach. For instance: a reduction in the use of military land by outsiders (characterized as "high", p. 74) would minimize the chances that fleas from plague-killed squirrels would spread to people (p. 72). That would take care of a large segment of the health emergency. Further, a reduction in grazing to the lowest possible minimum, compatible with fire-hazard precautions, appears to be the best long-range method for reducing the ground squirrel population. Finally, use of zinc phosphide and intensive flea-treatment (as recommended by Mr. R. Train, p. 95) would take care of damage by ground squirrels to installations, and further reduce the danger of plague to humans.

In short: this draft EIS has left me with the conviction:

a) that there are too many ground squirrels in Fort Ord, Fort Hunter-Liggett, and Camp Roberts;
b) that treatment with 1080 is not necessary in the short run, and not desirable as a long-term method of controlling the situation;
c) That the Army is more interested in its grazing revenues and "good neighbour" relations with adjoining communities and private ranchers than in the ultimate solution of the problem or the environmental health of the Federal lands it occupies.

If I had any say in the matter, I would not grant a waiver of E.O. 11643.

Sincerely,

Erica C. Garcia

Erica C. Garcia
Assoc. Prof.

3. Troop maneuvers and bivouacs occur on the open range. The military personnel are exposed to ground squirrels and their fleas at these times. Flea control will be conducted as appropriate. See page 163.

4. Squirrel population would be expected to build up again rapidly following initial control. Therefore, further control by 1080 or zinc phosphide may be necessary. If studies now underway demonstrate that changes in grazing practices will maintain ground squirrels at an acceptable low level, then, of course, the rodenticides may not be required as often.

L5 Feb 77

Office of Facilities
Headquarters
7th Infantry Division
Fort Ord, CA 93941

Dear Sirs:

I wish the following ststement to be included in the Revised Final EIS on Ground Squirrel Control-Fort Ord Complex. Thank you.

I believe that the following points were not considered in the EIS.

Page 87-94 | 1 | 1. Ground squirrel populations increase in overgrazed areas as mentioned on page 39. Therefore, reduction of overgrazing will reduce the numbers on squirrels. This should be considered.

2 | 2. The evidence for plague is poor. With three cases (with no location given) in 1974-76 (Table 9) in an area with numerous outdoor activities in which human-squirrel contacts are high, the danger of plague does not appear very high. If I am not mistaken, two of those cases of plague were in the Sierra Nevada Mountains- a location not comparable to central coast.

3 | 3. The effect on the Kit Fox was not established in the report. Are there only 100-3000 in all of Calofornia (Laughrin) or are there 10,000 (Morrel)?
4 | How many are on the Fort Ord Complex. If there is only one den, as mentioned in the report, it sounds as if they are rare. The EIS covers this very poorly.

Page 160 | 5 | 4. Compound 1080 is a very toxic compound. At 2mg/kg for humans (Table 13), the lethal dose for an average person is less than a teaspoon. Trained personnel with adaquate medical backup will be needed. Since Zn phosphide is measurably safer, there would be less chance for an accident.

Noted | 6 | 5. The cost differencial between the Alternate 1 and the proposed Course of Action is minimal, and the safety factor in great, the use of Zn Phosphide followed by reduced grazing appears to be the best course of action.

Thank you for allowing me to express my viewpoint on this problem.

Yours truly,
Tim Gaskin

Tim Gaskin
1374 Fredericks St.
San Luis Obispo, Ca 93401

2. See response 1 to Janie Figen letter, page 368.

3. A 1973 ground squirrel control program in San Luis Obispo County using 1080 was monitored to determine the effects of aerially applied 1080 baits upon the San Joaquin kit fox. No kit fox mortality due to secondary poisoning was observed even though kit foxes were seen hunting in the treated area 12 and 36 hours after treatment (Swick, 1973).

4. The 1975 Norrel study was a much more comprehensive endeavor and indicates that the kit fox is not as rare as once thought. In fact, many believe that the kit fox should be taken off the threatened and endangered species list. See section on threatened and endangered species.

CF: DIE &
4 mar

~~Asst Amb~~ WEA
File
2-16-77

Dear Sir,

I am writing in regards to the Environmental Impact Statement on the Army's purposal to use 1080 to kill ground squirrels at Fort Ord.

It is deplorable that such a highly toxic chemical such as 1080 is being planned for use when less toxic, more stable alternatives are available.

1 In addition, the E.I.S. doesn't mention which species of seed-eating song birds will be affected by this action. It only makes note of quail and doves - many song birds will be affected as well.

Most importantly, the E.I.S fails to point out the serious impact of secondary poisoning of hawks and eagles in our area. Our birds of prey are already threatened from pesticides and ignorant, sense-less killing. This would only make the situation worse.

Sincerely,
Diane Geroux

1. Other seed eating birds which may be affected by the proposed action or its alternatives include meadowlarks, goldfinches, and white crowned sparrows.

CF: Sec Dist
23 mar

3-19-77

DIRECTOR OF FACILITIES ENGINEERING
7TH INFANTRY DIVISION
FORT ORD, CA 93941

SUBJECT: DRAFT EIS, GROUND SQUIRREL CONTROL, FORT ORT COMPLEX, CALIFORNIA

GENTLEMEN:

I HAVE REVIEWED THE SUBJECT EIS AND BELIEVE THE ARMY HAS NOT ADDRESSED ALL OF THE IMPACTS OF THE PROPOSED POISONING PROGRAM NOR ADDRESSED OTHER ALTERNATIVES FULLY.

1 AERIAL BROADCASTING OF 1080 TREATED FOODS ON CAMP ROBERTS AND FORT HUNTER LIGGETT EXPOSES THE SAN ANTONIO AND NACIMIENTO RIVERS TO POSSIBLE PESTICIDE CONTAMINATION FROM STORMWATER RUNOFF. THESE RIVERS PROVIDE THE BASIS FOR RECREATION USE OF RESERVOIRS BELOW THE HUNTER LIGGETT AREA, AND THE RIVERS ARE USED TO TRANSPORT WATERS FOR HUMAN SUPPLY AS THE PASS THROUGH CAMP ROBERTS. PROTECTION OF THESE WATERS FOR THEIR DOWNSTREAM USERS SHOULD BE ASSURED BEFORE COMMENCING POISONING OPERATIONS.

AERIAL BROADCASTING WILL ALSO EXPOSE EVERY GRAIN EATING AND EVERY RODENT EATING ANIMALS TO 1080. MOST PREDATORS WILL NOT STOP EATING POISONED RODENTS. 1080 WILL UNDOUBTEDLY FIND ITS WAY UP THROUGH THE FOOD CHAIN.

EACH COMPLAINT OF GROUND SQUIRRELS IS OF A NUISANCE. THE THREAT OF PLAGUE IS NOT PROVEN - IN FACT ON ONE UNCONFIRMED SQUIRREL CASE OF PLAGE WAS FOUND. 33% OF THE DOMESTIC DOGS SAMPLED DID HAVE PLAGUE - PERHAPS IT WOULD BE WISER TO POISON ALL DOGS?.

SINCE THE SQUIRREL COMPLAINTS ARE NUISANCE IN NATURE, POISONS COULD MORE APPROPIATELY BE APPLIED BY HAND INTO BURROWS. ROADWAYS, AIRSTRIPS, BUILDINGS, AND AREAS ADJACENT TO PRIVATE LANDS COULD BE POISONED IN SUCH A MANNER AS BURROWS APPEAR. MAINTENANCE PERSONNEL MUST INSPECT THE FACILITIES ROUTINELY, COULD NOT ~~THE~~ THEY ALSO TREAT SQUIRREL BURROWS AS THEY FIND THEM?.

ONE ALTERNATIVE NOT FULLY EXPLORED BY THE ARMY IS THAT OF SHOOTING SQUIRRELS IN NUISANCE AREAS. SHOOTING IS NOT AS MANPOWER INTENSIVE AS THE REPORT, (EIS), STATES. I HAVE PERSONALLY CONTROLLED GROUND SQUIRRELS THROUGH THE USE OF "VARMINT" RIFLES, AND FEEL THEY ARE AN EXCELLENT MEANS OF CONTROLLING RODENTS WITHOUT SECONDARY REPERCUSSIONS. I AM PERSONALLY OFFERING MY SERVICES AS A "VARMIN HUNTER" TO THE ARMY TO SHOW THE VALIDITY OF MY CLAIMS. COLONY BY COLONY CONTROL OF NUISANCE INFESTATIONS IS POSSIBLE.

AGAIN, I AM WILLING TO DONATE MY TIME TO USE MY OWN FIREARMS AND EXPERTISE TO PROVE MY CLAIMS. I OFFER MY SERVICES IN GOOD FAITH.

THANK YOU FOR READING THESE COMMENTS

JOHN GONI
1149 ATASCADERO ST.
SAN LUIS OBISPO, CA
93401

1. Contamination of the San Antonio and Nacieniento Rivers is highly unlikely. 1080 will not be applied closer than 100 feet to any stream or body of water. It is normally applied during May and June, periods of very low precipitation, followed by three more months of little or no rainfall. (see page 165).

AD-A071 161 INFANTRY DIV (7TH) FORT ORD CA F/G 6/6
GROUND SQUIRREL CONTROL, FORT ORD COMPLEX FORT ORD, CALIFORNIA.(U)
APR 77 C L MCNEILL

UNCLASSIFIED NL

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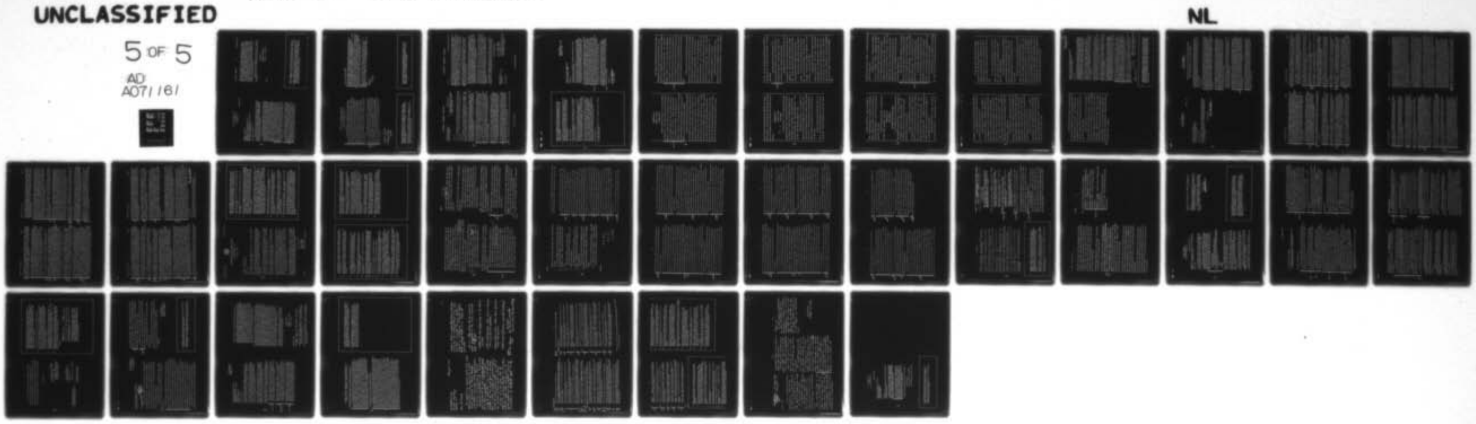

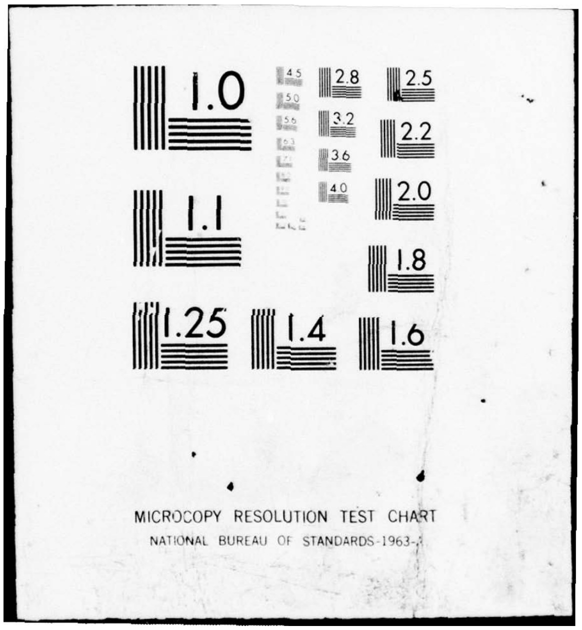
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DANIEL L. GORNEL, M.D.
P. O. BOX 6447
CARMEL, CALIFORNIA 93921
INTERNAL MEDICINE

18 March 1977

Charles L. McNeill
Colonel, CE
Director, Facilities Engineering
Department of the Army
Headquarters, Seventh Infantry Division
Fort Ord, California 93941

Dear Colonel McNeill:

I write this letter with respect to the proposed use of 1080 on Fort Ord military complex grounds. It is my expectation that this letter will be included among the materials which are forwarded to those authorities who will ultimately make the decision.

I have carefully reviewed the draft Environmental Impact Statement dated February, 1977, and it is my understanding that the basis for seeking the exemptions from Executive Order Number 11870 is the potential hazard of the development of plague infection in humans using the subject territories. Without debating the obvious difficulty of translating potential hazard into an actual hazard, I would like to point out that the Environmental Impact Statement suggests that adequate control of the plague hazard can be obtained by use of Alternative 1, that is, using no 1080 but emphasizing use of zinc phosphide. If the hazard which justifies the exemption to 1 the relevant Executive Order can be controlled by other means, it would appear to me to be mandatory that the procedures employed avoid the use of the chemical toxicant which has the higher potential for secondary poisoning, namely 1080, to comply with the Order's intent.

I am disturbed by one other aspect of the proposal. The use of 1080 as proposed will require repeated usage every two or three years according to the information presented. In view of the obvious toxicity of 1080 and 2 particularly in view of the notice of rebuttable presumption against registration of 1080 by the EPA, to me it would appear unacceptable to plan a program which is dependent upon continued, indefinite use of 1080. To me it appears totally inadequate, even granting that

1080 may be required on a short term basis, to propose a program which fails to consider simultaneously development of techniques which will allow reasonable control of a recurring problem without indefinite use of a highly toxic substance. Such considerations would necessarily include investigation of the cause of the current ground squirrel population status and it is my suspicion that attention to such factors as possible over-grazing could have a salutory effect on the long term management of the problem. This may be even more critical in view of the current climatic expectations.

I appreciate this opportunity to express my concerns in these matters, and I further appreciate your attention to them.

Sincerely,

Daniel L. Gornel

Daniel L. Gornel, M.D.

DLG:jh

1. Zinc phosphide is not without secondary poisoning potential and, in general, affects birds more adversely than 1080 does.

2. Repeat treatments with 1080 would not be used if unacceptable impacts were observed following initial treatment, or if Environmental Protection Agency or other studies demonstrate that unacceptable impacts may occur. Other control measures may be more appropriate at that time.

STATEMENT ON THE CHOICE OF COMPOUND 1080
FOR GROUND SQUIRREL CONTROL

1 The EIS does not present adequate data as to the necessity of using Compound 1080 rather than less dangerous means of control. That 1080 is in fact a very dangerous substance is recognized by the Army, since the proposed action limits its use to the open range at Hunter Liggett and Camp Roberts; fumigants, anticoagulants, and other rodenticides will be used in areas of human activity. The only reason given for seeking an exemption from the ban on the use of 1080 is the threat to humans from fleas leaving plague infected ground squirrels. Yet the use of 1080 is not proposed in areas where humans are likely to be exposed. The Public Health emergency is therefore no reason at all for allowing 1080 to be used on the open range.

2 It is also stated in the EIS that 1080 is the "agent of choice" because it is 90% effective, compared to zinc phosphide which is 60% effective. In the first place, this is not an acceptable reason, under the Executive order banning 1080, for allowing an exemption. In the second place, the EIS states that it is not intended to eliminate the ground squirrels, but only to hold down the numbers in areas of high concentration. It seems obvious that this degree of control can be achieved with less dangerous substances than 1080.

Debbie Gornel
Monterey County
S.P.C.A.

1. 1080 is proposed for use on the open range where troop maneuvers and bivouacs occur frequently. These military personnel are very likely to be exposed to ground squirrels and their fleas.
2. Zinc Phosphide is considered acceptable; however, it is definitely less effective than 1080. Zinc phosphide is not without secondary poisoning hazards.

My name is Debbie Gornel

1 I see that the EIS says on page 124 that "birds are generally quite tolerant to 1080". I should therefore like to read a statement made by David Zimmerman that appeared in Audobon Magazine March 1976, pages ~~102~~ 101-103: referring to a whole class of birds, not imune amont them eagles, hawks and other meat eating ~~animal~~ birds "Richard Randall, former coyote poisoner for the Fish & Wildlife Service of the Department of the Interior said in the years he laid poison bait for coyotes that he "found more golden eagles that I thought Compound 1080 had killed than I did coyotes. I autopsied 35 birds. Fluorescent tracer (which was used to detect poison) was located in 23 birds, strychnine in 5 and 1080 in 18, 13 of these were raptors."

So I just don't feel that we should be using a poison that can kill ~~18~~ 13 out of 23 eagles. I don't think that we can trust our wild creatures to such people who give them deadly poisons and then come up with a statement that "birds are generally quite tolerant to 1080".

Debbie Gornel

1. 1080 treated bait used for ground squirrel control, is prepared at much smaller concentrations than 1080 bait for coyote control. The hazards of using either control method are manifested in how the bait is applied.

LITTLE CREEK RANCH

Department of the Army
HQ, 7th Infantry Division
Fort Ord, California

February 20, 1977

RE: Draft Environmental Impact Statement
Ground Squirrel Control, Fort Ord
Complex, February 1977

Dear Sirs:

Dr. Betty S. Davis, Sierra Club Spokesperson, has my permission to read this letter and submit the attached exhibits, at the public hearing February 24, 1977. Although I am not a member of the Sierra Club, I totally support the Club's concerns in this matter.

My name is Bob Gray. I was born and raised on a wilderness ranch in Oregon. I now own and lease 600 acres of sheep and cattle country in San Mateo, California. For 25 years I was a trapper and predatory animal hunter for the U. S. Fish and Wildlife Service in both Oregon and California. I retired in 1972.

I have extensive personal knowledge of the effects of 1080 on wildlife because I used the poison under the direction of various USFWS supervisors in Oregon. After I became aware of the secondary effects of 1080 (years 1948-1949), I refused to use the poison even when instructed to do so by my superiors. (See attached Exhibit A, "1080 Poison: Some Recollections".)

1 The use of 1080 in any manner, for any purpose whatsoever is unthinkable. Once 1080 is released in the environment, it is out of control. The chain of non-target animal, bird and insect deaths continues long after 1080 is released. 1080 remains

2 in the soil for a long time. I know from experience that animals that died from 1080 do NOT decay rapidly, in contrast to the statement on page 157 of the Draft.

3 "... flesh decomposition is relatively rapid..." is what the Draft says. I personally witnessed 1080-baited carcasses that were put out in the winter, still preserved well into the following Spring, sometimes for as long as 6 months. 1080-baited carcasses seem to be somewhat "pickled", even after a long period of time. The lack of normal decay in 1080-baited carcasses strongly increases the possibility of carrion-eaters being poisoned.

4 Prior to 1948, when I was working as an animal predatory hunter for the USFWS, I was repeatedly warned by my supervisors that the SMOKE from 1080 is deadly to both man and animals. That is, when a 1080-baited carcass is no longer useful, burning of the carcass was considered a means of destroying it. I was told that the smoke, if breathed by man or animal, is lethal. Following this thought, if 1080-treated grain was placed in the open grasslands on any of the Military Reservations, and we had a drought-induced grass fire, what would the effects be on Man and animals?

5 On pages 124 and 156 of the Draft, mention is made of the susceptibility of members of the Dog Family (Canine) and Cat Family (Feline) to the secondary effects of 1080. The San Joaquin Kit Fox, a member of the Canine Family, is on both the Federal and State list of Endangered and Rare Species. The Kit Fox is known to be a predator on the ground squirrel. "No 1080 should be used at all, much less "within one mile of any known kit fox den", (page 161, Draft statement.)

6 Why it is that the mountain lion is not listed in Table 4, page 19 as fully protected

7 in California? The lion, as a member of the Feline family, is highly susceptible to 1080 poisoning. The mountain lion is protected by a legislative moratorium on the sport hunting of lions. The California Department of Fish and Game's legislative mandate for the study of lion populations occured in the Hunter-Leggett Reservation/Los Padres National Forest area. (See Exhibit B with photographic attachments, and Exhibit C.) In a personal conversation with Mr. Richard Weaver, DFG Wildlife Biologist in charge of the lion study on December 10, 1976, he said that there are 17 known mountain lions in the Hunter-Leggett Reservation area.

8 On page 152 of the Draft concerning median lethal doses of 1080, the quantities sufficient to kill a mountain lion are listed as "unknown". "Unknown" also applies to the California Condor which is listed as Endangered Species on both the Federal and California lists.

The proposed action for control of ground squirrels using 1080-baited grain should not be permitted for the following reasons: secondary poisoning effects on many species of animal life, including species that are endangered, rare and protected; 1080's absorbtion and holding in the soil; there is no known antidote (Exhibit D); no known studies of the lethal effects of smoke from 1080-baited carcasses or 1080-treated grains on air-breathing animals, including Man; there are effective ALTERNATIVES to 1080, even though the cost is slightly higher.

Although I have misgivings about the use of any poison, zinc phosphide would appear to be the safest to use, at least as far as toxicity to the Kit Fox and Condor are concerned. Zinc Phosphide would appear to have no impact on soils, therefore could not threaten the rare and endangered plants in the target areas. Zinc Phosphide should be applied ONLY by hand in areas of human use or in areas of special concern, such as dens and roads. This method of ground squirrel control would achieve reduction of population with the minimum amount of adverse effects on the non-target species.

I do not feel that sufficient time has been permitted the public to comment on this Draft EIS. A public meeting should be held on the Monterey Peninsula, on a Saturday, so that those interested persons might make their feelings known.

— Respectfully submitted,

M C Bob Gray

M. C. Bob Gray
U. S. Fish and Wildlife Service Trapper and Predatory Animal Hunter, retired.
Farmer, Rancher and Woolgrower.

Route 1, Box 324
Half Moon Bay, Ca., 94019
415-726-2917

Enc. Exhibits A-D

303 Reindollar
Marina, California 93933
February 11, 1977

Director of Facilities Engineering
Fort Ord, California 93941

Gentlemen:

I have reviewed your draft EIS on the proposed ground squirrel control program on the Fort Ord complex.

It would appear that the recommendation to cut the grazing on the complex would have the beneficial effects of reducing ground squirrel populations by as much as 44% as well as increasing wildlife values. This option would reduce ground squirrel populations gradually, thus minimizing effects upon the prey dependent predator species, including birds, mammals and reptiles.

1 Page 145

The EIS gives only minimal and inadequate coverage to the effects of shooting as a control method. It is recognized that shooting is not feasible near occupied dwellings and that aerial or hand application of chemical control agents in these areas is probably the most practical. However, it has been demonstrated that shooting can effectively reduce squirrel populations in open areas. There are many ground squirrel hunters who would willingly pay the daily hunting fees for the opportunity to shoot ground squirrels. These hunters use high velocity center-fire .22 caliber scoped rifles worth several hundred dollars for this sport. Additionally, most have a substantial investment in expensive reloading equipment, and are not prone to cause vandalism problems. The high velocity .22 center-fire cartridges are safer than many other types of rifle bullets in that they utilize a frangible bullet which disintegrates upon hitting solid objects, rather than ricocheting.

2 Noted

The EIS does not mention that moneys from these hunting fees go into a special fund at Fort Ord which is used exclusively for fish and wildlife management programs on the Fort Ord complex. I believe that a reasonable estimate of income from squirrel shooting would be $5,000 annually within three years. Those monies would help enhance both fish and wildlife values on the Fort Ord complex.

Sincerely,

Michael L. Johnson

Michael L. Johnson

1. There is no evidence to support the claim that 1080 can result in anything more than secondary poisoning. 1080 is not considered as cumulative to any practical degree (Crabtree, 1962).

2. The rapidity of carcass decomposition will be dependent upon a number of factors - among them weather conditions. No evidence has been found to indicate that squirrels poisoned with 1080 take longer to decompose than do squirrels dying from other causes.

3. Same as comment 2.

4. Given the small quantity of 1080-baited grain to be distributed, it is unlikely that a hazard would exist in the event a grass fire occurred.

5. Based on the field studies conducted jointly by the California Department of Fish and Game and the Department of Agriculture, no adverse effects on the San Joaquin Kit Fox of 1080 application have been observed. The "one-mile radius" *was a distance recommended* by the Department of Fish and Game.

6. The mountain lion has since been added to the list on page 19. As indicated on Page 170, the LD_{50} of 1080 for the mountain lion is unknown. Assuming a mountain lion has an LD_{50} comparable to that of a house cat or bobcat, it would be possible that a mountain lion could ingest a sufficient number of squirrels to cause mortality. The number of squirrels that would be required to be consumed to cause that mortality would be dependent upon those factors listed on page 174.

7. Same as comment 6.

8. No toxicological studies of 1080 on mountain lions or condors have been undertaken.

PRESENTATION BY

ROBERT R. MARBLE

CARMEL VALLEY

Noted 1

My name is Robert Marble, and I am a cattle rancher in Carmel Valley. On my ranch, people who see it continually comment to me about the abundance of wildlife on my property. I have an abundant amount of quail, deer, bobcats, mountain lions, coyotes -- you name it. And we have been using 1080 on our ranch for over 15 years. We have been applying it manually, I might add. It has been very effective in curtailing the ground squirrels and does not appear to have had any bad effects, as far as non-target species are concerned.

It seems to me that on Hunter Liggett and Camp Roberts at the present time, that since the ground squirrel problem is so out of hand, that the balance of nature is already -- well, there is no balance of nature at this point. I am not sure the reason for it, but I have a feeling that it is because in the past, predators have been removed from the land. If humans are going to use this land for agriculture, in order to balance it out again, we must be the predator ourselves and remove part of the population of ground squirrels, so that at some future time, we can encourage some form of predator to return, who will at that time keep the ground squirrels in control.

The ranchers in Monterey County and the whole state of California, and I assume the rest of the nation, are the people who are responsible for maintaining open space, maintaining the beauty of the country around them. It is rather distasteful, I guess, to me, and I know to the other ranchers in the audience, to have a lot of people who are not responsible for the management of land and who have never had anything to do with the management of land to stand up here and tell us that we should reduce our numbers on our grazing lands, and that we are basically responsible for the fact that there is so little grass.

Noted 2

I would turn the point around and say that the ground squirrels, to a great extent, are responsible for the consumption and destruction of a great deal of the feed on our native range lands here in Monterey County. The statistics that I have heard in the past -- and I do not put them forward as being 100 percent accurate -- are that 40 ground squirrels over the period of a year will consume or destroy as much feed, bulk feed and seed, as one yearling steer. That maybe is a starting point. I do not know if that is 100 percent accurate. But by my observations on my property, it is accurate.

I would also like to add that the ground around squirrel burrows which is destroyed by the squirrels, is very, very hard to put back into production. The ground is literally

ruined for quite a few years after the squirrels are removed from the ground. I would strongly urge the Army to push ahead with its 1080 program, and I hope that they are able to use it. Thank you.

PRESENTATION BY

VIOLET M. ROSE

PASO ROBLES

I am Violet Rose. I have a ranch that joins Camp Roberts for three miles. Then said 1080 would not control the squirrels. It did, till the Army quit poisoning, and they moved in by the thousands. They destroyed my crop. We have a beautiful ranch. They have drilled holes. I had to sell a horse because he stepped in a hole.

If you see my bad leg here -- it is because I was riding a horse and he stepped in one of their holes. And they said that coyotes eat squirrels, eagles, mountain lions. That is not so. When the coyotes and the ground squirrels moved in, the kit foxes moved out, and so did our red and our gray foxes.

If they can find a better poison than 1080, I am for it. But 1080, the squirrels eat it, they go in their den and die. If you use strychnine, they will die outside the den. Our cats and dogs and anything will pick them up for years and die. So that is why I am for 1080. It is the best poison.

Noted 1

I have seen quail eat the grain and not die. I have had a band of chickens eat 1080. They did not die. I ate the banty chickens. I am here today. Birds in their own habitats, they are different than these labs.

I disagree with that woman that said mountain lions eat squirrels. Nothing will eat squirrels unless they are starved to it. Even my cats, they will only pick up young ones. And deer and other animals do not like to eat where the squirrels have been, because they have a bad odor.

Up to 1970, our ranch was full of foxes, rabbits, and deer. I will invite you to come down to my ranch any day. You will not see the rabbits. You will not see the kit foxes. But you will see coyotes and squirrels. You will see eagles. I have a pair of eagles.

I get very angry when they say ranchers are not for animals and conservation. That is a lie. I am very conservation-minded, and I like seeing animals. I used to ride every morning on the ranch and view these kit foxes. The kit fox eats like a cat. They will pick up a field mouse. They will pick up a kangaroo rat. They will eat grasshoppers. They will eat crickets. They will dig up the grasshopper eggs.

We have no owls there. That is not because of 1080. Did you ever realize -- but killer. That kills our birds. Anybody is invited to my ranch, and I will prove to them what has destroyed it. And it is not 1080, because we have used it for years.

But when the squirrels moved in, the deer and the kit foxes, they disappeared. Thank you.

PRESENTATION BY

MISLA PETROVIC

CALIFORNIA NATIVE PLANT SOCIETY

I live in King City, and have lived there for the last twenty-five-and-a-half years. I am not an ecologist or a biologist. Neither am I a farmer or a rancher. I did not intend to speak, but some statements that were made tonight more or less forced my hand.

I happen to be a supervisor for the Third District for Monterey County, of which I am very proud. I feel very honored. But the Third District goes all the way to Monterey Bay. I am not supervisor for south county. Thus, I am not trying to cater to the voters of the south county. What I will say will please them. It probably will displease quite a number of my voters in the northern part of my district. So I am talking quite sincerely.

I did not intend to talk, as I said. But some of the statements provoked me. I cannot keep quiet. Thus, my address to you will not be logical. I put down certain notes, and I will repeat them.

The danger of plague -- without being a biologist, I know it -- increases, I believe, in geometric progression, with the increase of the carriers of the plague. So even now, the present population of the squirrels, which is enormous, does not yet contain the danger. The danger will be achieved, we do not know when -- very soon. I know it from Germany and the wild pigs. As soon as they get too many, swine pests come in and practically wipes them out, and starts again. That will happen with the ground squirrels, and from ground squirrels to us.

Noted 1

What struck me tonight especially is the fact that most of the anti-1080 people were not addressing themselves to what has happened, actually. Where the danger is danger, which is inherent in everything -- we have the biggest danger being the motor vehicle. What is the danger that is not important? To what extent was the danger materialized?

We had the Fish and Game representative here who said that at the beginning, the record was not good, but in recent years, out of 30 years, the record is, I believe, perfect. So let us not paint a danger or a Frankenstein, and then criticize the Frankenstein that we created.

With these poisons, we are sometimes in the position of a voter when he has two candidates to vote for and does not

like either. You settle for the one that you despise least.

We are considering the cost of 1080, if we use it. Just think of the cost if we do not use it.

We are talking of overgrazing. Do not stress -- Dr. Davis and Dr. Balingee -- contribute substantially to that overgrazing. How come that Hunter Liggett, where we do not use 1080, is practically devoid of any wild animals, except squirrels and coyotes, whereas if you go to private lands, there are plenty of everything? Why do we not, when we talk of 1080 -- please, ladies and gentlemen -- realize we are not talking of something that we want to introduce for the first time? We are not taking the voyage of Columbus to look for Asia by going west.

We are talking of something which we have known for many years. What made me, especially, decide to address you are some remarks regarding the ranchers that somehow made them appear one-sided, selfish, without regard for other aspects of what they do. If they were that way, if they ruined the environment in which they live and operate, you wouldnot have the best farmers and ranchers under the sun.

And I know what I am talking about. I am from a rural community, from a landowning family in eastern Europe. I have covered Europe and America, and still to see another valley with better ranchers and farmers. So they know what what they are talking about to you.

We have been using 1080 for around 30 years in this valley. The only known accident was a cow, a human accident. 1080 was not to blame. Somebody put it into a bucket and left it in the yard. The cow came and ate it. So who is to blame? The man who handled the 1080, not the 1080.

As I said, all of you came by car. None of you walked. Now, a car is the biggest danger, as far as I can tell. You pollute the air. You endanger the wildlife, human life -- damage everything.

The April, 1976 meeting where I got my initiation into 1080 and rodent control was completely public. We had four or five members who were opposing it. We had seven different public agencies, six of them agreeing that 1080 is the answer.

We wish that there was something better, but we are human, and we have to choose within the possibilities. We cannot invent or imagine or wish something to happen. If we had better poison, we would accept it. The only suggestion which I have, to which Mrs. Hughes, somehow not explicitly, but in an aside referred, is that after the 1080 is applied -- I would apply it in stages, apply it one afternoon, and the following morning, cover the area to collect any animals and the squirrels that have died above the ground.

At the April meeting last year, we were assured that in excess of 90 percent of the kill die underground, which means they cannot be seen at all. They get sick, and as everybody does when they do not feel well, they run home. The only squirrels that die above ground are those who take more than one lethal dosage.

I have a whole list, but I do not want the Colonel to stop me, and I have to abide by the rules. In conclusion, I would say this. Our ranchers have to put up with the drought, with adverse climactic conditions. They have to put up with bad markets. Please don't force them to have to put up with the squirrels, if we can get rid of them without endangering much of anything. This is the time where they should have and deserve your full consideration. They are going through a heck of a time. Thank you.

Cholame, California
18 February 1977

Office of Director of Facilities Engineers
Headquarters 17th Infantry Division
Fort Ord, California 93941

Dear Sir;

We the undersigned, having been involved in the farming and livestock industry here in eastern San Luis Obispo, County, California since 1929, do now seriously abhor the fact that technicians within our highly technological society can find no other means of controlling peaks in rodent populations than through the use of Compound 1080 (Sodium Floroacetate).

Compound 1080 is a highly poisonous substance for which no known antidote is presently known. Compound 1080 is also a substance whose poisonous effects passes down through the food chain with but little diminution in it's toxicity. Information on just how far this toxicity reamins in the animal food chain in non conclusive.

That compound 1080 treated bait, applied to an area via the aerial process, creates havoc among most mammalian species as well as many species of birds, is a well established fact. This degrading influence on an area can only bring about environmental chaos among wild, indigenous species of mammals and birds.

That Compound 1080 is very difficult to trace in the body of an animal that has succumed to it's toxic influence, seems all the more reason that this poisonous substance should fully restricted in any outdoor environmental.

Long range influences of compound 1080 in the human food chain has been sadly overlooked. Aerial application of 1080 treated grain, to control ground squirrel populations on Hunter Liggett Military Reservation in Monterey County, California, in 1977, could be especially dangerous to people who consume the meat from livestock pasturing on these lands during the poisoning operation.

1 Aerial application of poisoned grain for rodent control is non-selective. With range grasses in short supply and of stunted growth in 1977, livestock sonsume these grasses nearly as soon as any new growth becomes available. Poison grain falling on this short grass would be picked up by livestock in the process of their daily foraging for food. Any livestock going directly from the range to market for slaughter could pass compound 1080 on into the human food chain in a matter of a few days. This is a most serious matter that has been overlooked in the past.

With negative information far out-weighing any positive information regarding the future use of compound 1080 to control ground squirrel populations on Hunter-Liggett Military Reservation I beg that it's use be witheld

Sincerely

Eben McMillan – Gladys M. McM

Eben McMillan & Gladys ... McM

C.C. To
Congressman Leon Panetta

1. Bait will be applied, at the rate of 2.5 kernels of yellow 1080 treated, crimped oats per square feet, only in areas of dense ground squirrel colonies. This grain will generally be removed by ground squirrels and other rodents and insects within a few hours. It is extremely unlikely that livestock will consume any of this grain.

IAN I. McMILLAN
SHANDON, CALIFORNIA 93461

April 1, 1977

Colonel Charles L. McNeill
Director of Facilities Engineering
Headquarters, 7th Infantry Division
Fort Ord, California 93941

Dear Colonel McNeill:

I want to thank you for your favorable consideration in granting my request for an extension of time in which to prepare the enclosed comments on the Draft Environmental Impact Statement, concerning Ground Squirrel Control on the Fort Ord Complex.

Sincerely yours,

Ian McMillan

IAN I. McMILLAN
SHANDON, CALIFORNIA 93461

COMMENTS OF IAN McMILLAN ON DRAFT ENVIRONMENTAL IMPACT STATEMENT:

GROUND SQUIRREL CONTROL, FORT ORD COMPLEX, CALIFORNIA.

I am a native resident of the Shandon area in northeastern San Luis Obispo County, California, where I have spent a lifetime in agriculture and where for the last 42 years, I have been owner-operator of a 1360-acre grain and livestock ranch. This is in the same region as Camp Roberts and Fort Hunter Liggett which are main parts of the Fort Ord Complex.

GENERAL COMMENTS

1 It is understandable that ground squirrel populations on the Fort Ord Complex, particularly Fort Hunter Liggett and Camp Roberts, have increased in the 5 years following termination in 1972 of a massive control program that previously operated for almost three decades using Compound 1080 as the main rodenticide. Compound 1080 exceeds all other toxicants as a cause of secondary poisoning. When used to kill rodents the effects are more drastic on the rodent's predators particularly coyotes. On ranges treated with 1080 to kill ground squirrels in this region the coyote has been eradicated through secondary poisoning. Normally the coyote is a main predator of the ground squirrel.

2 For other predators of the ground squirrel that might not be seriously affected by 1080, the sweeping reduction of their prey species would cause their own numbers to lower. Operating over a period of decades, this broad-spectrum reduction and eradication of prey and predator alike would produce an artificial ecosystem depending entirely for its stability on continued artificial control. Thus, when the long-practiced applications of 1080 were terminated by Executive Order in 1972, and no other methods of control substituted, an abnormal increase of the subject ground squirrel populations could be expected.

Another contributing factor in the ground-squirrel problem on these extensive military lands is a program of excessive grazing that for years has steadily produced conditions of sparse, weedlike, range growth that are well-known as being conducive to high numbers of ground squirrels.

3 Noted This comment is based on full recognition of these main background realities of the ground squirrel problem on Fort Hunter Liggett and Camp Roberts. It recognizes that certain proper measures of control are justifiably needed. However, its first purpose is to point out and demonstrate that the proposed action and alternatives described in the subject DEIS, appear to be wrong in design and purpose and that an alternative action is needed that is not offered in the Draft Statement. This alternative would be a program of controlling ground squirrels using only the rodenticide diphacinone and without use of 1080. Except that it would not include or allow use of 1080, this proposed alternative would closely compare to Alternative 2, as is presently offered in the subject DEIS.

4 Importantly also, this proposed alternative to the proposed action, as it would not involve the use of 1080, would therefore not require an Emergency Exemption from the 1972 Executive Order and thus would not require an Environmental Impact Statement. Why this feasible and effective alternative was not projected, as it should have been, when 1080 was restricted in 1972, is the main question that fails to be properly discussed in the subject DEIS.

5 Failure to include a plausible alternative to the proposed action is typical of other serious faults and deficiencies that together characterize the DEIS causing it to require almost complete revision. The Draft Statement is arranged without orderly coherence and continuity making it difficult to interpret and analyze. It fails to acquaint the reader with background information essential for a comprehensive evaluation of the proposed action. Erroneously, it gives the impression that all toxicants used to control ground squirrels were banned on the military installations by a 1972 Executive Order restricting use of secondary poisons on federal lands. It fails to explain that Compound 1080, which has the most drastic secondary effects of any rodenticide, and which was the main toxicant used in the former control operations on Fort Hunter Liggett and Camp Roberts, has effective, well-known, commonly-used substitutes which do not cause secondary poisoning and were not prohibited by the 1972 Executive Order.

Noted

6 The Statement fails to even refer to the primary question of why the responsible agencies, particularly state and county agro-pesticide authorities, failed to prescribe and recommend these available alternatives when 1080 was restricted in 1972. It fails to discuss the possible linkage between this failure and the persistent advocacy of 1080 by the involved pesticide authorities. It fails to mention the 5-year campaign led by local agro-pesticide interests to nullify the 1972 Executive Order and to reinstate 1080 as the main toxicant in a massive, broad-spectrum pesticide program killing prey and predator alike on these extensive military lands.

One of the most questionable aspects of the Draft Statement is its obvious bias toward justifying and rationalizing a project that appears to have already been decided upon.

SPECIFIC COMMENTS

7 Page 1: Although indicating here that the DEIS was prepared by the Director, Facilities Engineering at Fort Ord, as based on studies done under contract by Jones & Stokes Associates, Inc., the draft fails to include needed particulars of the contracted studies including how the contract was arranged; background and membership of the firm engaged; cost of the contracted study; time, plan, and procedures of the study; who did the field work.

8 Page 3, paragraph 2: Reference to "millions of dollars of damage" caused annually in California by ground squirrels. This calls for documentation particularly as it relates to highly-questionable data appearing later on pages 237 and 238.

Noted

9 Page 3, paragraph 3: Reference here, and again on pages 192, to a 1908 county ordinance, gives a wrong impression. The reader should be informed that 1080 was unknown in 1908, that the toxicant is not available for private use, and that land-owners or operators must request to have 1080 used on their property and must sign a document releasing the agency in charge of the applications from liability regarding loss or damage that might result. To imply that the 1908 county ordinance would require control by use of 1080 as prescribed in proposed action is misleading.

10 Page 3, paragraph 4: Fails to give year and related studies of first use of 1080 on the Fort Ord Complex. There is evidence that studies were conducted at Camp Roberts in the 1940's and that the findings indicated death of non-target species, including yellow billed magpies and burrowing owls that had ingested grain baits treated with the toxicant.

11 Page 4, paragraph 1: Fails to explain urban setting of Fort Ord and the related high risk of using the more hazardous 1080 in that area. Also fails to explain why, if the desired control can be achieved on Fort Ord without use of 1080, is it so imperative that the toxicant be used on Fort Hunter Liggett and Camp Roberts.

Page 4, paragraph 2: The quote from a recommendation of the Cain Report appears to be out of context. It should be accompanied by something specific of what the report set forth as a basis of the quoted recommendation. It should be explained that the report did not call for restriction of non-secondary poisons in field rodent control and thus did not prevent control on the Fort Ord Complex.

Changed

12 Page 4, paragraph 3: This statement would further make it appear that "all chemicals to control ground squirrels" were restricted by the 1972 Order. This is again erroneous and misleading and seems typical of a prevailing bias toward rationalizing and advocating 1080 for use in the proposed action.

Page 5, paragraph 1: Confirms that the rodenticides, diphacinone and zinc phosphide, have been available for use on the Fort Ord Complex. This has particular significance as it contradicts the previous paragraph.

Page 5, paragraph 2: Should emphasize that the extensive monitoring has not produced positive evidence of plague in the monitored squirrels.

Page 5, paragraph 3: Is again misleading in making it appear that an exemption from the 1972 Executive Order is necessary for use of diphacinone and zinc phosphide. Again it fails to clarify that an exemption from the Executive Order is required <u>only because 1080 is intended for use in the proposed action.</u>

13 Page 5, paragraph 4: Fails to explain the special provision through which 1080 is allowed on private and not on federal lands. Also fails to indicate and explain the increasing rate at which diphacinone is replacing 1080 as a more efficacious method of controlling ground squirrels on private lands in the region of the Fort Ord Complex.

14 Page 6, paragraph 1: Why, if only 2.4 percent of acres flown were actually treated, was it necessary to fly the other 97.6 percent? Why would aerial application, instead of hand application, be needed at all for such a small percentage?

Changed

15 Page 6, paragraph 2: "San Luis Obispo County uses only 1080 grain bait to control ground squirrels." This is seriously misleading and is contradicted later on page 129, paragraph 4. The county supplies zinc phosphide and diphacinone at cost to private individuals with use of diphacinone steadily increasing in the county.

16 Page 35, paragraphs 4 and 5: Here it states that "unless 90 percent (of ground squirrels) are eliminated in a given year there will be no general reduction in numbers." It further indicates that this high degree of control is intended in the proposed action. But it also states that "neither the proposed or alternative action ... are intended to eliminate or eradicate the grounds squirrels, but rather to suppress their populations." This leaves the confusing question of how two adult squirrels, male and female, with a grown, average litter of 8 young, making a total of 10, if reduced by 90 percent, thereby leaving 1 squirrel, would not have the final effect of eradication.

17 Page 33, paragraph 1: The 8 predator species mentioned here as "among the natural enemies that prey on ground squirrels" altogether seem more impressive as a potential "density-dependent" factor regulating numbers of squirrels than is otherwise indicated in the DEIS.

Page 39, paragraph 1:. Although indicating that colonies are concentrated in certain habitats and that "ground squirrels are rarely seen living in areas of heavy tree and brush growth or on ungrazed land where dense stands of grasses are present," no specific determinations appear to have been made of the amount and distribution of land occupied by ground squirrels.

18 Page 40, paragraph 1: In the November 8-19, 1976, field observations by Jones & Stokes Associates, Inc., it is noted that "some squirrels were active above ground but there was no way to relate their numbers to existing total populations." How then could it be said on page 42, paragraph 1, that, "the squirrel populations at Hunter Liggett and Camp Roberts were judged to be the highest ever seen by the Jones & Stokes Associates, Inc. investigator (with 35 years of California field experience)?"

19 Page 42, paragraph 2: With burrows used as the "indicator of relative abundance," in the event of lowering numbers or disappearance of the squirrels, the burrows would remain for some time at least.

Noted 20 Page 42, paragraph 4: Of predators noted in the 12-day study period, it is highly significant that "no coyotes or bobcats were seen or heard." Equally significant is that no other reference to this observation appears in the DEIS. Evidently the status of these important ground-squirrel predators received little or no consideration in the study or in the preparation of the DEIS. Could it be that coyote and bobcat populations on the observed areas have not yet recovered from the impact of 30 years of 1080 applications which ended in 1971? In what is probably the most definitive of all scientific reports on the California ground squirrel (Jean M. Linsdale, University of California Press, 1946,) the wildcat was observed to be "capable of exerting a major influence on numbers of ground squirrels ...." One of the notable aspects of the DEIS, is the extent to which it appears to either overlook or ignore the findings of the Linsdale report.

Changed 21 Page 45, Figure 14: The map, as it indicates solid, extensive areas of squirrel damage on Fort Hunter Liggett, fails to be consistent with either the statement (page 40, paragraph 5) that "chaparral and woodland types do not support significant populations," or another statement (page 41, paragraph 6) that "ground squirrel burrows were generally found to be scattered in dense colonies throughout Hunter Liggett and Camp Roberts."

Page 49: The elaborate description of damage by ground squirrels to facilities and structures fails to explain why rodenticides other than 1080, that are now in use to control such damage and were evidently available when the described damage was occurring, were not used at that time.

Page 50, paragraph 1: The estimated $8,000,000 crop damage caused annually by ground squirrels in California seems highly questionable. For this to be even remotely plausible the use of 1080 and other rodenticides to eradicate ground squirrels on private lands of the state, as extensively practiced for decades, would have been highly ineffective, which would be inconsistent with the promised results of the proposed action. Incongruously, after this leading reference to extensive squirrel damage on private lands that are generally not adjacent to military installations, the next two paragraphs would make it appear that crop damage on private lands adjacent to Fort Hunter Liggett and Camp Roberts has been caused entirely by squirrels coming from the military lands.

Page 50, paragraph 4: Notably, the "field observations by Jones & Stokes Associates personnel did not substantiate reported damage to adjacent crops or pasture because of the time of year (November)." The evidence used is evidently represented entirely in communications and reports received from the two main centers of promotion and advocacy of 1080 in the region - the Monterey and San Luis Obispo County Departments of Agriculture. Two such official reports appear as appendices C and D on pages 237 and 238. The first is a listing of agricultural damage caused by ground squirrels to lands adjacent to Camp Roberts and Hunter Liggett in Monterey County; the second gives "survey data of ground squirrel damage to crops adjacent to Camp Roberts" in San Luis Obispo County. The Monterey County report lists damage to 1,300 acres of cereal grain for a cash loss of $312,000. To be authentic this would require total destruction of planted grain that would otherwise have produced 2 tons per acre with a price of $120 per ton, making an average cash loss of $240 per acre. On the basis of known production records for dryland grain in this region, this per-acre loss would appear to be an exaggeration of at least 100 percent.

In what seems to be another glaring discrepancy, it is stated in the previous paragraph that "land owners in Monterey County adjacent to Fort Hunter Liggett and Camp Roberts reported an estimated pasture and grain crop loss for the years 1972-75 of over $697,000 (Appendix C)." There is no mention here of damage to row crops. However, row crop damage is listed in Appendix C as amounting to $346,500, almost half the total loss. It seems notable here that an earlier description of "Adjacent Land Use" at Fort Hunter Liggett, (page 28, paragraph 2) refers to the adjacent cropland as "mainly grain crops such as barley and wheat and dry or irrigated pastureland." Where, adjacent to Fort Hunter Liggett, would be the acreage of row crops that suffered the listed damage?

But even more significant in the Monterey County report is a listing of "reported loss from coyotes" amounting to $7,150. The question here is how would the listing of livestock losses from coyotes be relevant to crop damage caused by ground squirrels? Would this incongruous listing have the design of indicating that restriction of 1080 on the military land has, through lack of secondary poisoning, allowed an increase of coyotes which are causing livestock losses on adjacent private ranges? Such an increase of coyotes would be fully in keeping with the local, common knowledge of what 1080, when used to kill ground squirrels, does to annihilate coyotes on the same ranges. But more significant would be the inadvertent disclosure of this common knowledge which otherwise in the DEIS is notably denied or evaded. (Page 158, paragraph 4.

Page 238: Although prepared by a different office and appearing in different form, the report for San Luis Obispo County of squirrel damage to crops adjacent to Camp Roberts, again demonstrates the common exaggeration. It lists squirrel damage to dryland grain as steadily increasing throughout the 4-year period, 1973-1976. For this to be possible the high losses of 1976 would require a corresponding increase in potential production. This could not be the case in a year of declared drought disaster as was 1976 throughout the region of the listed damage. In 1976, nearly all dry-farmed grain crops in the area qualified for drought disaster relief which paid for crop losses regardless of cause. Evidently the report of ground-squirrel damage was formulated without cognizance of the 1976 drought and crop failure and of how this would rule out the increased loss listed for that year.

22 Page 61: Flagrantly misrepresents the ecologic role and importance of the ground squirrel as an essential component of its native ecosystem in central California. ("The Burrowing Rodents of California as Agents of Soil Formation" Joseph Grinnell, 1943).

23 Page 62, Figure 28: This illustration is obviously intended to make it appear that ground squirrels girdle and kill well-grown, native trees. Is there other evidence to substantiate the proposition? Is there proof that the tree was girdled by ground squirrels? For evidence of what ground squirrels may do to enhance woodland growth see "Up-hill Planters." Joseph Grinnell, 1943.

Pages 63-78: Fails to explain how the campaign to reinstate use of 1080 on Fort Hunter Liggett and Camp Roberts began as a project to prevent agricultural damage, with control of plague later used as the main rationale. Fails to acquaint the reader with the close working relationship between county and state agricultural and health authorities in a coordinated effort to remove federal restrictions on 1080. This coordination of bureaucratic force is typically confirmed in the San Luis Obispo County Resolution which appears on pages 105 and 106 of the DEIS. Significantly, as the records would show, although the resolution was presented to the Board of Supervisors by a county health official as a matter of public health and safety, it was written in the office of the County Department of Agriculture.

Pages 79-85: Grazing, as the main factor affecting ground squirrel populations on the Fort Ord Complex, is slighted here, seemingly to the point of evasion.

24 Noted Page 79, paragraph 4: "Because of the present drought and consequent low-range productivity, the cattle stocking at the present time (December 1976) on Fort Hunter Liggett is approximately one third of that authorized under the leases...." What might well have been pointed out here is that the number authorized is proving to be far in excess of what the range can carry on a basis of sustained yield. It should have been explained that the reduced stocking was initiated only after strong protests from local conservation interests; from a ranking official of the California Department of Fish and Game; and from the Congressman then representing the District. The draft should explain that prior to November, 1975, grazing leases on Fort Hunter Liggett were issued on an area basis and at that time were changed to a basis of AUM's. The reader should be informed about an official hearing of April 10, 1976, held at Fort Hunter Liggett in response to the letters protesting the excessive grazing.

25 Noted The DEIS should discuss that part of the hearing which brought out that in the closing months of 1975, when the 1976 drought was already in prospect, and with the ranges bare from the previous overgrazing, one of the first acts of administering the new grazing program was to allow an increase in numbers of cattle on the main lease far in excess of what was stipulated as the upper limit for that time of year, on any year, (Page 244, paragraph 1). Of the deficiencies that characterize the DEIS, one of the most significant is its failure to refer in any way to that important April, 1976, hearing.

26 Noted Page 80, Table 10: The general nature of the grazing program on the Fort Ord Complex seems further indicated in this listing of grazing leases and amounts paid. It is notable that three of the four leases on Fort Hunter Liggett are held by the same lessee. The amounts paid per AUM when compared to comparable transactions on other federal lands, seem incredible. Amounts paid for the four grazing leases on Fort Hunter Liggett range from a low of $7 per AUM upward to $9.80; $12.17; and on to a seemingly unreal high of $15.625 per AUM. The DEIS should explain whatever plausible reasons there might be for this extreme discrepancy in amounts bid and paid per AUM. Even the low of $7 is exceptionally high in comparison to the standard grazing fees of $1.50 per AUM paid on local federal ranges administered by the Bureau of Land Management. At the higher rate of $15.625 per AUM it would cost $187.50 to pasture an animal for a year, extremely above what would appear to be economically feasible. But even this incredible figure is dwarfed by a fantastic $23.55 per AUM paid for a 5,854-acre cattle lease on Camp Roberts. How could the experts of Jones & Stokes Associates, Inc. have missed the glaring significance of these higher amounts paid per AUM?

Page 84, paragraph 2: Reportedly this new range study will be conducted by the same school of expertise responsible for the research and advice used to rationalize and defend past and present excessive grazing practices on Fort Hunter Liggett. The DEIS should discuss the question of how the new research can be expected to find and report anything wrong with a program it has prescribed and has consistently and most effectively espoused.

Pages 221, 222, 223: How the DEIS could be so consistently biased toward advocacy of the proposed action seems well indicated in those listings of the personal communications through which much of the information was evidently obtained. Of the 57 persons listed, there is only a single representative of a citizen conservation group. Of the 10 county, state and federal agencies represented, only one, the U. S. Environmental Protection Agency is represented in the DEIS as not in favor of the proposed action. Of the others, only the U. S. Fish and Wildlife Service might be considered as being neutral. The others, including the California Department of Fish and Game, as indicated in various passages of the DEIS, and in other evidence, can well be considered as proponents of the proposed action.

Page 85, paragraph 5: With it noted that the grazing "appeared to be very intense" and that "there was a great reduction of dry litter," why no explanation of how this could occur if the stipulated terms of the grazing regulations (pages 243-247) were properly administered?

27 Noted Page 93, paragraph 2: This reference to the <u>Rebuttable Presumption Notice</u> against registration of 1080 should have been discussed together with a later reference on page 192, paragraph 2, which includes that the EPA notice makes questionable "the authority to use this chemical in 1977." The draft should have explained here that the federal notice was followed by announcement of an EPA funded study on effects of 1080 on non-target species to be conducted in California in 1977. It is understandable that until the findings of the pending study are finalized, any removal of present restrictions on 1080 would indeed by questionable. Also calling for discussion is the all-important question: With the study to be conducted by the same authorities that for years have insisted that their information on the subject matter was unquestionable, how can it be expected that the new research will find anything that would seriously discredit the established information?

28 Changed Page 129, paragraph 4: What would explain the range in cost of diphacinone from $0.30 to $1.00 per pound. The price charged by the San Luis Obispo County Department of Agriculture is $0.27 per pound and this should apply to squirrel control on the local military reservations.

29 Noted Page 129, paragraph 5: Fails again to discuss the increasing use of diphacinone on extensive private holdings in the region, and the extent to which this method of control is preferred for economical, as well as other reasons, over 1080. Also, the question of energy, as represented in manpower, a renewable and readily available resource, versus the non-renewable energy required for aerial application, appears to have received no consideration in weighing the expense of manual application of diphacinone.

30 Page 135 Page 131, Table 11: The cost of $2.00 per acre for diphacinone is not prohibitively greater than the $1.63 per acre listed for hand application of 1080. Why, then, the claim (page 129, paragraph 5) that use of diphacinone would be "prohibitively expensive?" On the 4,475 acres (page 144, paragraph 5) to be treated by 1080 in the proposed action, the use of diphacinone would appear to cost no more than an additional $1655.75, not a prohibitive amount.

31 Page 134, paragraph 2: "The irrelevance here is only exceeded by the misconception. With diphacinone steadily replacing 1080, and with this being due to its demonstrated efficacy, it seems erroneous and misleading to make it appear that "Federal Pesticide Law and EPA's regulations ... established a rather adverse climate for the development of new rodenticides ...." What the DEIS should instead emphasize is the massive and most effective efforts of the pesticide interests to discourage and oppose use of diphacinone to replace 1080, as is graphically evident in the proposed action.

Noted

Page 138, paragraph 3: No cognizance was evidently given to extensive, well-known situations where no artificial control has been practiced, where established squirrel populations remain "at or below levels considered acceptable on the basis of public health or economic damage," and where predation appears to be the main regulating factor.

32 Page 144, paragraph 5 continued on page 145: Treatment of 5 percent of the range (4,476) at $0.16 per acre would cost $716, quite less than the indicated $14,370. Also, $105 per hour is understood to be the customary charge for aerial application of 1080. Why the $150 per hour for the proposed action?

33 Page 146, paragraph 4: With the San Luis Obispo County Department of Agriculture supplying diphacinone at a price of $.27 per pound for private use, why the cost of $1.00 per pound for the proposed action? On Camp Roberts this would reduce the proposed cost of poison per acre from $2.00 to $0.54 a reduction of 67 percent.

Changed

391

34 Page 151, paragraph 6: "Baits for aerial and hand baiting are formulated with the minimal concentration of rodenticide effective for the target species, and this markedly reduces the potential hazard to many nontarget species ...." The misrepresentation could hardly be inadvertent. The concentration to be applied in the proposed action is a mixture of 1.5 ounces of 1080 per 100 pounds of grain (page 151, paragraph 1). This is 50 percent greater than the standard dosage of 1 ounce per 100 pounds of bait used in hand applications to control ground squirrels for years prior to introduction of aerial application of the poison. Official information also confirms that ground squirrels have been effectively controlled by applications of 1080 mixed at the concentration of 3/4 ounce per 100 pounds of grain, one half the concentration to be used in the proposed action.

35 Page 154, paragraph 1: "An occasional seed-eating bird has been killed, (by 1080 bait) although no evidence exists that any significant losses to even very localized populations has ever occurred except with waterfowl." It is difficult to believe that the experts of Jones & Stokes Associates, Inc. would all be unaware of a 1968 poisoning incident in northern San Luis Obispo County in which 13 birds of 5 different species, including California quail, were found dead in a ranch yard the second day after the nearby area was treated with aerial applications of 1080 to kill ground squirrels, with it found that the poisoned birds had ingested the baited grain. As documented in a letter from the County Agricultural Commissioner, the birds were collected and held for analysis by the Department of Fish and Game. The bait involved was the standard mixture of "1½ oz. 1080 per 100 lbs. of squirrel oat groats, dyed brilliant yellow." As to whether this could be considered a "significant loss," it should be pointed out, for any rodenticide to produce a nontarget kill involving 5 species at a single location at one time would probably represent the most significant impact of its kind ever to be documented in the history of animal control.

36 Page 166, paragraph 6: Schitoskey's main findings were that kit foxes would readily feed on kangaroo rats poisoned by 1080 and would be killed. Why are these critically important findings about 1080 not indicated in the DEIS as are those which refer to zinc phosphide?

37 Page 172, paragraph 4: What proof is available of even one of the "few demonstrated cases of secondary poisoning from anticoagulants under field conditions?" The fact that dogs were "unaffected by continuous ingestion of mice which had eaten warfarin bait" should have more emphasis in the DEIS. This seems to disqualify as outright propaganda the proposition on page 129, paragraph 2, that "the potential of secondary poisoning from anticoagulants has been reported because they accumulate in the liver of a poisoned animal."

38 Page 187, paragraph 3: "The abundance of squirrels would increase the food base of predators, thus increasing the density of snakes, carnivores and hawks ...." This diametrically contradicts a main thesis of the DEIS which would make it appear (page 158, paragraph 4) that "there has been no evidence presented indicating that controlling ground squirrels has altered the density of coyotes ... either by secondary poisoning or by reducing their food base."

39 Page 195, paragraph 2: Mention here that the proposed action may result in some primary poisoning losses of nontarget wildlife including burrowing owls, raises the question of whether previous use of 1080 on Fort Hunter Liggett and Camp Roberts may have caused the disappearance of that species as appears to have occurred generally where the toxicant has been used as a rodenticide on ranges occupied by the little owls. Is the burrowing owl gone from its former habitat at Camp Roberts? It is not listed for that area in the faunal listing of Appendix B. What the DEIS should have thoroughly discussed is the question of what has caused the burrowing owl to disappear from its native ranges in the region of Camp Roberts, when those ranges have been treated with 1080.

CONCLUSION

40 As indicated in the preceding comments, I find the DEIS to be critically out of compliance with the main stipulated requirements of the National Environmental Protection Act. Its faults and deficiencies are so gross and inexcusable as to disqualify it as the required basis for a final EIS. Instead of providing the reader with sound, comprehensive information on which to evaluate the proposed action or alternative actions, this draft statement presents a biased assortment of unsubstantiated arguments and data that consistently and unmistakably support the proposed action and appear to have the further design of supporting a decision already made on the proposed action.

Noted

Rather than recommending that another DEIS be prepared, I propose that the control measures now in operation on the Fort Ord Complex be simply extended to include all areas where control of ground squirrels is justifiably needed. As this proven alternative would not involve use of 1080, it would not require an emergency exemption from Executive Order 11870 and further more would not require preparation of an EIS. It would simply be the method of controlling ground squirrels that is increasingly replacing use of 1080 throughout the region of the Fort Ord Complex. As this method would involve no hazards to predators of the target ground squirrel and only a minimum of hazard to other nontarget species, it would avoid the massive, broad-spectrum annihilation of predator and prey alike that on the basis of common knowledge can well be expected as the most certain impact of the proposed action.

Ian McMillan

REFERENCES CITED

The California Ground Squirrel, University of California Press, 1946.
Letter dated June 28, 1968, from Earl R. Kalar to Ian I. McMillan.
Joseph Grinnell's Philosophy of Nature, University of California Press, 1943.

Earl R. Kalar
Agricultural Commissioner and
Sealer of Weights and Measures

Telephone 543-1550, Ext. 254

DEPARTMENT OF AGRICULTURE

Post Office Box 637
San Luis Obispo, California - 93401

June 28, 1968

Mr. Ian I. McMillan
Shandon, California 93461

Dear Ian:

This is answer to our telephone discussion of June 28, 1968 and your letter of June 9, 1968.

Five bird species were found after poisoning operations on the Sinton Ranch. These are being held in our freezing compartment at this office for analysis by the Department of Fish and Game. There are 1 quail, 1 blackbird, 1 starling, 5 linnets and 5 sparrows.

I would like to correct your statement that poison bait included a coverage of the central buildings and headquarters residence as in error. There was no poison bait applied on or immediately adjacent to buildings on this particular ranch.

There was a swath of grain placed closer to residences than we like to see. Corrective procedural steps have been taken with the pilots to prevent this in the future.

I was notified of some dead birds in the area by Mrs. Sinton on May 29th. In checking the property, it was treated by air for ground squirrel control on Monday, May 27th, using bait 1½oz. 1080 per 100 lbs. of squirrel oat groats, dyed brilliant yellow. I went over shortly after being notified and did collect all dead birds in the area and suggested that the ranch personnel collect any further dead birds or rodents in the general vicinity of the ranch buildings and workers' houses as a safety measure to their pets, both cats and dogs.

Our phone conversation for improvement of communications between rodent control agencies and conservation interest is an important step to improve present understanding and, I hope, to provide more effective control of depredating species with maximum safety to nontarget wildlife, domestic animals and to people.

Very truly yours,

Earl R Kalar
Earl R. Kalar
Agricultural Commissioner

ERK/mn

2. Since the numbers of ground squirrels above ground and available to predator varies from season to season due to their habits of aestivation and hibernation, they must not be a year-round stable diet of any predatory species (March, 1976).

4. The cost of using diphacinone, which requires repeated feedings, is very high.

5. Other rodenticides also have secondary poisoning effects to some extent.

7. The U. S. Army Corps of Engineers placed a notice in the Commerce Business Daily (September 10, 1976) requesting the qualifications and experience of firms interested in preparing an EIS for ground squirrel control on the Fort Ord complex. Jones & Stokes Associates responded and was selected by the Corps to prepare the draft EIS. A contract for $47,000 was negotiated to cover the preparation of the draft, printing of 400 copies and attendance at a public hearing.

   The draft EIS was prepared by professionals, including Robert Jones, Harold Bissell, Jonathan Ives, Karen Miller, Delores Brown of Jones & Stokes Associates, Inc., and Rex Marsh and Dr. Walter Howard of the University of California, Davis. The draft EIS was prepared during November and December of 1976 and January 1977. Field studies were made as indicated in the draft EIS, and numerous contacts with other professionals and with the general public were made, also listed in the draft EIS. In addition, the literature was searched to the extent feasible and both published and unpublished reports were considered.

8. These data were assembled through questionnaires. There is no claim the figures given are in any way documented.

10. The early programs using 1080 differed from the proposed action in that the concentrations of 1080 were much higher. A whole grain rather than a rolled crimped oat was used also. See page 160.

11. Ground squirrels are not nearly as numerous nor as widespread on the rangelands of Fort Ord and, at this time, a less effective rodenticide, such as zinc phosphide, will reduce the population adequately.

13. There are no special provisions. The Executive Order applied only to federal land and not to other property.

   The use of diphacinone or other anticoagulants for squirrel control has been increasing in many parts of California. It is an effective rodenticide, although considerably more expensive to use than 1080 or zinc phosphide. As the squirrel damage to crops increases in dollar value, it becomes more economically feasible to use anticoagulant rodenticides which have advantages over acute toxicants, i.e., the lack of bait shyness.

It has been only in recent years that commercially prepared baits have been registered and sold for ground squirrel control in California.

14. The pilot must fly over all the suitable habitat to search out the ground squirrel colonies. This same complete coverage would be needed if a crew of men were used to apply the bait by hand.

16. The statement made by Storer and Jameson (1965) was cited to illustrate that ground squirrel populations are not easily reduced, and that to have any appreciable effect on the population, it has to be reduced rather drastically at one time.

17. The prey population has a more significant impact on regulating the numbers of predators than the predators have on the population of prey.

18. As stated, it was based on general field observations and burrow counts.

19. Burrows used the previous spring can be distinguished in the fall from older unused burrows and, unless the area has been subjected to some rapid population decline, the numbers of burrows give an indication of the potential population which may exist there.

22. The benefits of rodents is discussed on page 41.

23. The benefits of rodents is discussed on page 41.

32. $.16 per acre is acre habitat flown not acre treated. The 5 percent (4,476) acres to be treated is scattered among the 89,500 acres of potential ground squirrel habitat.

34. 1080 prepared at 1.5 ounces of 1080 per 100 pounds of bait is what is currently registered and used for aerial application in San Luis Obispo and Monterey Counties. The method of application necessitates a higher concentration than hand baiting to give consistent results because the bait is spread so sparsely by aircraft

35. Change made on page 129. In the instance cited, the birds killed may have become previously accustomed to atypical food, either by being fed or by picking up accidentally spilled grain.

36. This section is devoted to the secondary poisoning caused by zinc phosphide and not 1080, which is discussed on pages Schitoskey's work is cited on page .

37. Since the use of diphacinone is limited in the proposed action, it did not seem necessary to discuss in detail the secondary hazards of anticoagulants. The following reference sheds more light on the subject:

Evans, J. and A. Lorin, 1967, secondary poisoning associated with anticoagulant - killed nutria. American Journal of Vet. Medical Association. 151 (7): pages 856-861.

Rudd and Genelley (1956) indicated that deaths in dogs and cats occurred in a few instances from secondary poisoning involving the anticoagulant warfarin. In recent years the U. S. Fish and Wildlife Service has assisted in the development of an effective control of vampire bats by injecting live cows with diphacinone and then permitting the bats to feed normally on the blood of the exposed cattle. As a result, the bats would die (Gonzalez and Mitchell, 1976). This does represent secondary poisoning used in a very selective way.

A review of the dangers of warfarin poisoning to animals other than rodents was made by Papworth (1958), however, the article was not oriented toward secondary poisoning.

38. Ground squirrels are by no means the only animal food utilized by coyotes. Those predators which are feeding upon ground squirrels are obviously under-utilizing this particular food item based on remaining population.

39. Whether the burrowing owl was ever numerous in the area is unknown, as is its present population status. Plague has been isolated from the burrowing owl, and the owl implicated in its spread (Pollitzer, 1954). Birds of prey are reportedly quite resistant to plague (Pollitzer, 1954).

Because this Draft EIS tries so hard to reassure us that the dangers to our wildlife from secondary poisoning by 1080 are really "minimal--"the death of a few animals"-- that years of 1080 use in California have caused practically no secondary poisoning of non ~~one~~-target species, that California is so efficient and careful in handling 1080, etc., etc., I feel constrained to quote briefly from the literature on the subject: & Monterey Peninsula & all Calif has used so much

Nathaniel Reed, for 5½ years Assistant Secretary of Interior for Fish, Wildlife and Parks, said recently:

> "...I never will regret the decision to remove 1080 from public lands. I believe it to have been an evil. And I believe that animal damage control can give a level ~~lefel~~ of protection...without resorting to the highly toxic substances with such broad secondary poisoning effects as 1080..."

6

The Western Montana Scientists Committee for Public Information, a group of 26 professors and researchers based at the University of Montana, stated:

> "Since 1080 remains stable and does not degrade easily, it is extremely hazardous to animals higher in the food chain. House cats, dogs, pigs (note, pig hunters!), foxes, skunks, and coyotes have died after eating 1080 poisoned rodents. Rodent control programs in California reduced the coyote population by 30% in treated areas. Carrion feeding birds, such as eagles, ravens, magpies, and jays (and I might add condors and hawks) who attack the viscera first, are exposed to maximum concentrations of 1080. A coyote might die after eating poisoned rodents, and the eagles or magpies die from eating the coyote."

1 Noted

I should add that as canines ~~canids~~--foxes, coyotes, and dogs--get extremely sick before going into convulsions, they vomit copiously as they run, in their agony. Every pile of vomitus becomes another bait.

A bulletin from the Fish & Wildlife Service of the Dept. of the Interior states:

> "The secondary hazard to dogs, cats, pigs and carnivorous wild animals following the use of 1080 in field rodent control is significant. Even using precaustions as keeping domestic pets tied up for a period of days after poison is exposed, supplemented by darefully collecting and burning all surface kill that can be located still has not prevented accidental poisoning."

This, friends, is the U.S. Department of the Interior speaking, the big daddy of the 1080 business. From 1965 to 1970, by their own figures, they spread 807,775 pounds of 1080 poisoned grain over the western States.

The Montana Scientists Committee also said of direct mortality:

> "Six kernels of 1080 poisoned wheat killed adult blackbirds, eight kernels killed towhees, three kernels killed sparrows. A 50-pound deer died after eating fourounces of poisoned squirrel bait."

2 Noted

And there is the account in the Riverside, California Press-Enterprise, by staff writer Dick Lyneis, of his tour of a hill area recently treated with 1080. His guide was Douglas Buchanan, California Dept. of Fish & Game Game Watden.

7

"This area," said Buchanan, "usually is just teeming with

Page 3.

rabbits. And a couple of weeks ago I xaw at least 25 pairs of quail."

As his car bumped its way along the rutty trail with its two-way radio squawking away, the disturbance should have flushed out rabbits. Quail should have shot out of their cover.

There were no rabbits, and no signs of quail.

Did you ever smell death? The closer we got the less subtle the smell became.

The Bernasconi Hills had the appearance of a sort of... Dachau. Everything was dead, except for maggots and a few crows and bultures.

Carcasses of dead cottontails lay thoughout the hills. ...they weren't killed by guns...they were the victims of the Riverside County Agriculture Department's rodent poisoning program.

On the way out, we found another dead animal...a burrowing owl. A small, rare bird, a predator. It feeds on rodents. It dies when it feeds on rodents in the Bernasconi Hills."

Thank you.

V. W. Merz,
Carmel
2-24-79

RESPONSE TO THE EIS ON BEECHEY GROUND SQUIRREL POISONING AT THE FORT ORD COMPLEX
by Katie Newbold, Graduate Student in Ecology, University of California, Davis

Noted 1 The ground squirrel problem has not yet been adequately defined. Does one squirrel constitute a problem necessitating a poisoning program? If not, at what level does a squirrel population become a menace? How can squirrel population levels be accurately assessed? For the Environmental Impact Statement on ground squirrel control at the Fort Ord Complex, squirrel

2 populations were assessed using burrow counts as indicators of population levels. Based on a personal communication from Rex Marsh, it was assumed that burrow numbers greater than 50 per acre indicated a dense squirrel

Noted 3 population – i.e. a menace. This assumption is not valid. Squirrel burrows are semi-permanent and reflect the highest population levels attained on an area. Many factors cause fluctuations in small animal populations; a squirrel population can be at a low level and still inhabit an area with a large number

4 of burrows. In a study area observed by Fitch (1948:575), "The burrow system most extensive in 1940 had 93 separate entrances...Thirteen squirrels (9 males and 4 females) lived in the vicinity. Six years later in March 1946 this same burrow system was even more extensive, having 121 open holes, but only five squirrels (2 males and three females) were known to stay in the vicinity."

Noted 5 It is obvious that squirrel populations should be directly assessed or, if squirrel burrow counts are used to estimate population levels, the number of actively used burrows per acre must be assessed. (Note: I have not seen any burrow – caused gullies at Fort Hunter Liggett. The citation of Howard (1953) concerning erosion on p. 63 of the EIS is a secondary reference; I object to its use in the EIS.)

Noted 6 Linsdale was cited (p. 35, EIS) as saying that heavy populations of squirrels seem to be required tor the formation of runways. I would like to

Noted 6 point out that Linsdale's book is full of anecdotes and unsubstantiated statements. Constant use of a route by a few squirrels should be sufficient to cause formation of a runway.

Noted 7 If squirrel populations are found to be at high levels, the question of whether or not there is an emergency health problem due to threat of plague can be posed. Since no plague bacilli were actually found in the area for which poisoning is proposed, despite a thorough search, I wonder if an emergency exists. I also wonder if poisoning of squirrels coupled with dusting for fleas around cantonement areas would, in the event of an emergency, be sufficient to eliminate the threat of plague. The EIS (p. 64) cites a reference stating that "some infective fleas may live 10 to 52 days." According to Miles et. al. (1952:25,26), "The evidence would indicate that O. labis is capable of surviving in numbers adequate to maintain a plague reservoir in an area for at least 2 months and very likely for a much longer time after the disappearance of the host species.....it might be postulated that nest fleas, due to their ability to survive for long periods without their hosts, are more capable of acting as plague reservoirs in the absence of the mammal host than are the more dependent fur fleas." Thus, if either of the flea species most common on squirrels is a "nest flea", the threat of plague might continue for at least a few months after a poisoning program is undertaken unless flea dusting is also undertaken in all areas where poisoning is proposed.

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Noted 8 The most emotion-laden question concerning the squirrel "problem" is the extent to which squirrels destroy crops and rangeland. This question seems to be the focus of most of the debate over whether or not squirrels should be poisoned. Do squirrels actually compete with cattle for food? This is not known. Most studies of food habits of squirrels are done by observing foraging squirrels (e.g. Fitch, 1948). Such observations can be misleading. Analysis of squirrel stomach samples is necessary to determine the actual diet

Noted 8 of squirrels. Fitch and Bentley (1949) reported large amounts of vegetation on study plots destroyed by squirrels but did not look at the percent increase or decrease of each type of plant in control plots as compared to plots foraged on by squirrels or palatability and nutrition of the plant species utilized by squirrels to cattle. Such studies need to be done. Frank Schitoskey (1973) has evaluated squirrel energy requirements and food habits; he did an extensive analysis of stomach samples. He still made no comparisons between food habits of squirrels and cattle.

Noted 9 It is well known that squirrels invade croplands and forage on valuable crops (Tomich, 1964). How much damage do they actually do? The cash value of crop loss due to ground squirrels reported by mail over a four year period to R. W. Nutter, Monterey County Agricultural Commissioner, was $697,069.00 for 40 ranches representing 77,921 acres (p. 237-238, EIS). I think it is reasonable to assume that farmers who are interested in seeing squirrels eradicated might exaggerate crop losses. Reports, therefore, should be substantiated by a qualified person before they are considered valid. I would like to know what losses were reported as being caused by gophers, deer, and rabbits over this same period. I question whether losses actually due to other animals have been attributed to squirrels. I have often seen deer foraging in groplands and Fitch and Bentley (1949) state that individual gophers destroy 1/4 to 1/3 what ground squirrels do, and that at high concentrations gophers may be more destructive than ground squirrels.

Noted 10 How far do squirrels travel to forage? I have observed individual squirrels and mapped their movements throughout days. The farthest any squirrel which I watched traveled in one day was 75 meters. I did catch a squirrel in a trap one day and in one 1/4 mile away the next day. This was during a dispersal period; during such a time squirrels commonly "explore" areas where they would not commonly travel. The presence of adjacent crops or of rangeland

10 Noted emptied of squirrels through poisoning might be an inducement to squirrels to disperse "out of season". Very little is known about movements of small mammals. Daily movements should, however, be distinguished in the EIS from dispersal movements, because they are over much shorter distances and are usually seasonal. A discussion of squirrel movements may be found in Evans and Holdenried (1943).

11 It has been suggested that if grazing pressure were reduced ground squirrel numbers would decrease in response. It appears that cessation of grazing, e.g. at Hastings Natural History Reservation, causes a significant decrease in squirrel numbers. (John Davis, Director of Hastings Natural History Reservation, could give an idea of the situation at Hastings.) Visibility is necessary to squirrel colonies for protection against predators ahd has been shown to be a very important factor in squirrel habitat selection (unpublished data from Don Owings). Obviously visibility is increased as grazing is increased. In the EIS (p. 137) it is stated that "Furthermore, complete exclusion of grazing at the USFS San Joaquin Experimental Range in Madera County did not eliminate ground squirrels (Howard, pers. comm.)." At the San Joaquin Experimental Range grazing was reduced and squirrel numbers also decreased. Squirrels are no longer considered by many to be pests there. While elimination of grazing in study plots did not eliminate ground squirrels entirely it did greatly decrease ground squirrel populations. A person to talk to concerning grazing and ground squirrel populations. A person to talk to concerning grazing and ground squirrels at San Joaquin would be Mr. Don Duncan; he can be contacted through the San Joaquin Experimental Range where he has worked as a range scientist.

12 Noted Changes in reproductive rate of ground squirrels with changes in population levels were not discussed in the EIS. It is well known that at high population levels squirrels exhibit low reproductive rates, and vice versa (see Chapman and

Lind, 1974). Thus, after a poisoning program squirrel females are likely to bear up to twice as many young as they would have before any poisoning. Also, animals which would not have produced young at high population densities might at very low densities (Slade and Balph, 1974). This would lessen the benefit of poisoning programs.

13 Noted I looked at squirrel reproductive rates in my study area last spring. Very few young emerged (less than one per female), although many females had appeared to be pregnant and then lactating. I hypothesized that the low reproductive rate was due somehow to the small amount of food available due to the drought. The same phenomenon was not observed elsewhere on Fort Hunter Liggett. If my hypothesis is correct, however, reproduction should be inhibited in more areas this year. Squirrel populations may be decreased naturally. Squirrel population levels and reproductive rates should be determined this spring.

14 Noted Reproduction of predators takes place at the time of the greatest food supply in many cases. At Fort Hunter Liggett for many predators this is the time when young squirrels emerge. Young squirrels cannot aestivate as they must forage almost constantly to grow and build up fat stores so that they can survive the winter. They are almost constantly available to predators during late spring and summer days. Since they have not had adequate time to learn about predators they are vulnerable. Loss of this food source might have a significant effect on the reproductive success of predators such as coyotes, red-tailed hawks, and eagles. (See Emlen, 1973 for a discussion about reproductive timing.)

15 Changed For several days last spring and summer I made hourly counts of adult and juvenile squirrels present in sun and shade in my study area. I found that, although the total number of adults was decreased slightly in summer as compared to spring, squirrels were present above ground throughout the day. They

15 Noted confined activities to shade areas during very hot hours. There was no evidence of large-scale aestivation.

16 Noted It is impossible to say how great an impact poisoning will have on furbearers. Don Owings and I have twice sited bobcats and once a coyote in our study area; skunk and racoon tracks have been seen; there is evidence that badgers have dug out burrow entrances in this area. All of these animals would be likely to pick up squirrel carcasses; some might even dig for them. If 4–6% of squirrels dying remain above ground (p. 159, EIS), danger of death by 1080 to many species of animals is likely. Rudd and Genelley (1956:138) state that "As with flesh baits, there seems to be no way of preventing secondary loss of some furbearers from 1080 used in rodent control." In the introduction of the EIS (p. xi) it is stated that "Adverse effects will include a loss of some coyotes, bobcats, domestic cats and dogs, and possibly (though not likely) of kit foxes." I believe that several other mammalian species might be affected.

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17 Noted Effects of poisoning on kit foxes could be more significant than is implied in the EIS. On p. 161 it is stated that "Special efforts will be made to locate kit fox dens prior to the control of ground squirrels." What sort of efforts are meant? Details should be spelled out in the EIS. Schitoskey (1975) states that, in his experiments with kit foxes, "One fox died within hours when fed a kangaroo rat (Dipodomys sp.) killed by 0.74 mg of 1080 or 12.8 mg of strychnine, amounts one rat might consume in field baiting programs. However, foxes survived repeated feedings of kangaroo rats each killed by 480 mg of zinc phosphide, equivalent to 3 times the LD_{50} for a fox and some 29 times the amount one rat might consume in bait." From this it appears that kit foxes are very susceptible to 1080. Poisoning by 1080 should be banned not only near dens but near places where kit foxes have been

17 Noted sited, also. Don Fine and Ray Azbill of the California Department of Fish and Game should be consulted about kit fox sitings.

18 Noted In late spring of last year we caught more birds in our traps (blackbirds, titmice, Oregon juncos, bluebirds, jays, magpies) than we did squirrels. Bait used was crimped oats. The proposed poisoning time is during this same period. Oats colored the same as the poison grain should be tested in traps to find out what bait palatability to birds is before the use of poisoned grain is assumed to hold no attraction to birds. The taking of bait by birds appeared to be a seasonal phenomenon, so bait acceptance by birds should be tested at a time as close to the poisoning time as is possible.

19 Noted If poisoning finally, after all the debate, is undertaken, this poisoning program should be studied extensively to provide information to be used in other similar situations. A team of scientists could monitor the changes in and effects of poisoning on wildlife, plant, invertebrate, and soil microflora populations. Poison residues could be monitored. Animals found dead above ground should be analyzed to determine potential secondary poisoning effects.

20 Changed (Note: Kalmbach (1943,1945) is cited on p. 158–159 of the EIS; no reference to Kalmbach appears in the EIS bibliography.)

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2. Because of the time of year the EIS was prepared, ground squirrel census methods other than burrow counts were not possible. General observations by various individuals during the past several years and the lack of any atypical dieoff of squirrels supported indications provided in the burrow count.

4. Assuming you accept and apply Fitch's 7.2 burrows per squirrel found in 1940 or 24.2 burrows per squirrel in 1946, the population at the Fort Ord Complex would still be high.

11. This was reported for the same area by Lindsdale (1946) and is referenced in the EIS.

HEARING - FOR DEPT. OF ARMY E.I.S. FOR GROUND SQUIRREL CONTROL
FORT ORD COMPLEX,
February 24,1977 - Kings City, California

By Margaret Owings

Serving on the Advisory Committee, associated with Dr. A. Starker Leopold - for the Research Study on the California mountain lion, its distribution and numbers carried out by Dr. Carl Koford.

May I call your attention to Page 17 - under FAUNA, it reads:

"The coniferous forest of both counties provide important habitat for many bird species, including nuthatch, creeper and Stellar jay,"etc...

"Many mammals, such as coyotes, bobcats, foxes, deer and bear inhabit these forests."

Changed 1 Question: Why is the mountain lion not included?

Dr. Carl Koford's four-year research study on the mountain lion - states:

"Because of the puma's position at the peak of the plant-herbivore-carnivore pyramid - its' welfare may sensitively indicate the general health of the eco-system."

Changed 2 Again, on Page 19, TABLE 4 the Mountain lion is not listed.
Certainly, in lion-country - we do not overlook the lion.

Only among the back notes of this E.I.S. do we find a statement that "the mountain lion has a habitat or food association with the Beechey ground squirrel". But no further mention is made.

Changed 3 Question: What is this "association"?

Dr. Maurice Hornocker, whose 8 year studies with the Idaho Cooperative Wildlife Research Unit, University of Idaho on the mountain lion - reported in proceedings of the Mountain Lion Workshop, held in Reno, Nevada, Jan. 1976 - that "actually the lion's main food in the summer months in Idaho was the ground squirrel." In these months, the lion favored

small prey, took very few deer, and concentrated on the ground squirrels. This Idaho study program included careful reports on cougar feeding but California Fish & Game studies do not, at present, cover the lion's food habits. But it is well recognized in this State that the mountain lion eats both squirrels and rabbits. Within the breeding range, females capture small prey to take to young kittens.

The Hunter-Liggett Reservation is lion-country - and certainly in lion-country, we do not overlook the lion.

In California's lion-population estimates, the Coast Range from San Luis Obispo to Monterey is one of the State's most concentrated
lion 400 areas. In Hunter-Leggitt and adjacent wild lands there can be as many as 8 resident lions (though 5 or 6 lions are more likely). This does not include young kittens nor does it include transient lions moving up and down the Coast Range. Hunter-Leggitt can be referred to as "a lion traffic zone", primarily of young pumas which have not established residence.

The value placed upon the role of the mountain lion in the State of California is increasing as their populations disappear from many of their former habitats. Because of this, a MORATORIUM on the hunting of lions has been in effect since 1973, during which time studies have been carried out in areas including the Hunter-Leggitt Reserve.

In short, we have full knowledge that the lion resides in this area and that the lion feeds on ground-squirrels and rabbits in the region under discussion. The presumption is that lions will be poisoned from preying on the ground-squirrels and rabbits killed by the 1080 poison.

May I make some further corrections in this Report:

On Page 17 - change the wording of "protected" southern sea otter to "threatened" southern sea otter.

On Page 19 - Table 4 - insert a capital "T" opposite "southern sea otter" to indicate its Federal status as "threatened"

Changed 4

On Page 19 - Table 4 - insert the word "threatened" after the word "endangered".

In describing the otter's range along the coast - correct it to read: "from San Mateo County to San Luis Obispo County."

WARREN R. PHILBROOK
67 COUNTRY CLUB GATE
PACIFIC GROVE, CALIFORNIA 93950

February 10, 1977

Office of the Director of Facilities Engineering
Fort Ord, California 93941

Dear Sir:

I have watched with interest, and some amusement and dismay, published reports concerning the ground squirrel problem at Fort Hunter Liggett.

I offer the following suggestion as a way of avoiding possible damage to other animals and birds if poison bait is used. It is based on an experience on a ten acre farm near Escalon, California more than fifty years ago. My father and I and an Uncle (who owned the farm) achieved an estimated kill of better than ninety per cent in a few hours.

Materials required

1

1 5 gallon can Carbon Disulphide (CS_2)
1 20# bag of cotton waste (any absorbent material will do, dried horse manure was a very good substitute)
1 box of matches
1 shovel

Method

1. Take a small wad of cotton waste, about the size of a chicken egg and saturate it with the CS_2. Throw it well into an open burrow.
2. Wait about 3 to 5 seconds for the CS_2 to vaporize.
3. While standing aside from the burrow, light a match and throw it into the burrow. The vaporized CS_2 explodes and releases sulfur dioxide (SO_2)
4. Close the burrow immediately with a shovel of dirt. If vapors issue from connected burrows nearby, close those also.

The CS_2 is heavy and will penetrate the burrow - if the gas and the explosion do not kill the squirrels the resulting SO_2 will and in a very short time.

Occasionally a squirrel may be able to dig out of a burrow but he will be groggy and can be finished off promptly with a swat of the shovel.

This procedure is very effective and does no appreciable damage to anything else. The noise of the

explosions and the SO_2 that may be released is, in my opinion far less damaging to the ecology than a days operation on the firing range.

I hope you may find this letter an easy way out of environmental impact reports and hearings that are costing us taxpayers a substantial amount of money.

Truly Yours,

W R Philbrook

1. Carbon disulfide is a good fumigant for the control of ground squirrel; however, it is gradually being replaced with methyl bromide which is more effective and will also control the fleas within the burrow.

Carbon disulfide is highly flammable and explosive, and unless used by trained individuals, accidents may occur. The total expenditure necessary to use the carbon disulfide method of ground squirrel control is too costly for extensive field use.

20 March, 1977

To: Congressman Leon Panetta

Re: Request by Dept. of Army to reinstate 1080 poison bait (Sodium monofluoroacetate) on federal lands.

Dear Congressman Panetta;

Noted 1 We are strongly opposed to the proposal by the Dept. of the Army to use 1080 treated grain bait (Sodium monofluoroacetate) applied aerially across open rangeland on Fort Hunter Liggett, Camp Roberts and Fort Ord.

This plan is scientifically unsound, and the possible effects, both short and long range have not been adequately evaluated, as they are stated in the Draft EIS Report prepared for the Dept. of the Army.

Too many statements and assumptions are made that are inadequately substantiated, or a matter of opinion based on personal comments made by various individuals, and not properly documented or supported by scientific fact or valid observations.

Changed 2 Also, many faulty references have been noted in the body of the text of the Draft EIS Report. Many of these are references that are incomplete, omitted, or in error. Many references are made to "personal comments" made by individuals, and used in place of any scientific evidence to support statements in defense of the plan to use 1080. Statements such as these are not adequate to defend this far reaching proposal, the long range impacts of which are virtually impossible to predict, given the data we now have.

Noted 3 The report admits (on pg. 197 of EIS) that "The long-term environmental losses would be in the area of unavoidable adverse impacts upon nontarget species, particularly other rodents, carnivores and birds. Some domestic cats and dogs may be lost in those areas ..... The kit fox may experience some loss for the same reason. Some coyotes may be lost in the areas treated. Some seed-eating nontarget rodents and possibly birds may be lost. "[1]

1. Draft EIS for Ground Squirrel Control, Fort Ord Complex, (1977) ; p. 197.

4 The report lists the(San Joaquin) Kit fox as an Endangered species. But the impact of this plan on the California mountain lion,(a fully protected species, which has its habitat in the Hunter Liggett areas) is not discussed in this section on impacts, although on page 235-6 of the EIS the California mountain lion is listed as a mammal which has a habitat and food association with the Beechey ground squirrel, and is also found on the military reservations involved. Owls, some rare and protected, are not considered, even though they prey on the smaller rodents and young or sick squirrels who would be themselves victims of primary or secondary po[illegible]ing.

5 The EIS report contains numerous other omi[illegible]ions of this nature.

By using a poison with such lethal, chain reaction effects, on other animals which share the same habitat area, we are seriously endangering the entire food chain in these ecosystems.

Just because the proposed action will probably not totally "eliminate "[2] any one species, is not a valid reason to allow the widespread killing of many nontarget species, directly and through the effects of secondary poisoning.

6 Alternatives

The use of Diaphacinone, proven to be effective in squirrel control, with less impact on the environment than 1080 bait, has been cited as being too expensive. Yet the cost of Diaphacinone varies widely and may not be as expensive to use as cited in the EIS. Also, the fact it has less of a devastating impact on the environment, should warrent its use.

Since damage to cattle rangeland and the supposed "threat of plague" are two of the main reasons for advocating the use of 1080, I urge that an alternative plan be considered; one that is less destructive and far reaching than the 1080 plan. Many biologists have testified at the public hearing held by the Army in King City, and their testimony should be

2. Draft EIS, p. 198, par. 4

given close attention. The California Association of Veternarians has also sent a letter to their representatives warning of the adverse effects of 1080, and asking that its use be denied.

7 It is admitted in the EIS that range cattle grazing on these federal lands will undoubtedly consume quantities of this 1080 poison grain. What effects will this have on the humans who consume that beef which has been contaminated with lethal 1080? Could it possibly cause cancer or genetic defects ? Does anyone have an answer to this question? Could this turn into a case similar to the "PCB" contaminated grain situation in Wisconsin, where humans are injured by the uncontrolled effects of a toxin injested by cattle or chickens from grain.

Quail will be exposed to the 1080 grain, especially if scattered by air. Many people hunt quail on these federal lands, legally or illegally, and they eat the quail they kill. What effect will this have on those people ? Does anyone know?

This issue certainly warrants further research, before a plan like this one proposed by the Army should be allowed to proceed!

For the above stated reasons, we feel it is very unwise to allow approval of the Plan to use 1080 bait on federal lands in California, as the Dept. of the Army requests, because the consequences of such action cannot be predicted, due to the nature of the chain reaction of effects which will be generated by this plan.

Therefore, we urge you to actively work against the approval of any exemption from the executive order against the use of 1080 treated grain bait, for ground squirrel control on federal lands.

We recommend instead, the adoption of a modification of Alternative # 2 Plan, using Diaphacinone applied into squirrel burrows, not broadcast aerially which could lead to greater negative effects.

Also, we favor, as do other biologists, and wildlife experts, the establishing of a buffer zone around the concerned military reservations, in order to minimize squirrel damage to adjacent privately owned lands, as mentioned on pg. 194 of the EIS.

Additional Solutions

Noted 8 A reduction in the number of cattle allowed to graze on these federal lands, at least temporarily, would also help ease the problems cited in the EIS. This idea was also supported by wildlife experts at the hearing.

9 Regarding the question of plague, the EIS cites three sources (on pg.72) that state that "ground squirrels in California are not a permanent reservoir of the plague, but rather that deer mice, meadow voles, etc, are probably the natural plague reservoirs." (Olsen,Nelson, Kartman p.72)

And further, "It is not known for certain whether some ground squirrels infected with plague can survive and thus maintain a plague reservoir."(Olson, and Kartman p. 72)

It also notes on pg. 72, par.6, that "Infective fleas leave dead rodents and may infect available new hosts."

10 If the Army is so concerned about the threat of plague, why have they not restricted the recreational use of these federal lands by the public? That would be one suggestion that should be considered before use of a lethal toxin is dropped by air over thousands of acres. It is possible that young children using these lands could eat enough of the poison pellets to become seriously ill.

Other agencies have expressed concern over this plan. Page 120 of the EIS cites: "Fish and Wildlife Officials - Both federal and state fish and wildlife agencies ...are particulary concerned with the potential impact of ground squirrel control programs on endangere nd threatened species."

We urge your consideration to these suggestions as an alternative to the plan for Aerial Distribution of 1080 grain bait on these federal lands.

Any additional expense or labor which may be involved in alternative plans (instead of use of 1080), will be well worth the effort, as it will insure better protection for our human, domestic and wildlife species from the unpredictable and possibly long term, devastating effects of lethal poisoning. Such irresponsible use of chemical toxins amounts to over-kill, and a tampering with our environment on too large a scale to be tolerated by the people of this state.

It is for these reasons that we urge you to do all you can to stop the approval of an exemption from the executive order banning the use of toxin 1080 on federal lands, as is presently being requested by the Department of the Army, on Fort Hunter Liggett, Camp Roberts and Fort Ord, California.

Yours Truly,

Joyce E. Raye

Mrs. Joyce E. Raye
Elementary School Teacher
with special interest in
environmental studies

David Raye

David Raye

Community College Professor

42 A Harper Cyn Road
Salinas, Calif. 93901

cc: Senator Alan Cranston
Assemblywoman Carol Hallett
State Sen. Robt. Nimmo

5. 1080 has been used for about 30 years in both Monterey and San Luis Obispo Counties and no evidence exists that "widespread killing of nontarget species" has occurred through direct or secondary poisoning. Chain reaction can hardly apply to field use of 1080 or zinc phosphide for rodent control since there is no evidence that either rodenticide goes beyond secondary poisoning.

6. See response to comment 5 in the Ian McMillan letter.

7. Sodium monofluoroacetate is not considered to be a cumulative poison as it tends to metabolize to non-toxic metabolites with time. Once ingested, sodium monofluoroacetate breaks down quickly and is not stored in the body. The likelihood of humans receiving chronic exposure by repeated consumption of 1080 would be unlikely. No carcinogenic or mutagenic studies have been conducted.

9. It is generally recognized that ground squirrels are not the permanent reservoir of plague, but it is known that the ground squirrel is one of the major animals directly implicated in the transmission of plague to man (Murray, 1964).

10. The 1080 bait is not in pellet form but rather a crimped oat applied at the rate of 2.5 kernels of grain per square foot. The human LD_{50} is fairly high, and any child would have to search to find enough to cause any harm.

Example:

Human LD_{50} = 2 mg/kg
Average child weight = 20 pounds = 9.90 kg

9.09 x 2 = 18.18 mg 1080 required to cause harm

Bait concentration = .15 ounce/pound = 44.11 mg 1080 per pound of grain

The 20-pound child would have to ingest 1/3 to 1/2 lb of grain to get a lethal dose. At the rate of application proposed, 1/3 to 1/2 pound would be scattered over a very large area. 1080 will not be applied around human use areas as a further precaution.

124 Jeffrey st.
San Luis Obispo, Ca.
93401
28 February, 1977

Director of Facilities Engineering
Fort Ord, Ca. 93941

7 Mar 77

Dear ~~Colonel~~ McNeill:

Plague, Plague, Plague. Alot of talk, alot of fishing around for meager bits of data to compile in a vague way to attempt to get the health emergency status for Compound 1080. The thin walls which held up your false front came tumbling down at the February public input meeting in King City. Does the Surgeon General think he has a solid base to stand on?

It is fortunate that this 271 page document is only a draft, and you will have the oppurtunity to present a less embarassing final E.I.S..

1 My main concern in this issue is the use of 1080 instead of a poison less harmful to beneficial non-target species, namely, Birds of Prey. As stated on page 122, the best time to control the squirrels in Monterey and San Luis Obispo counties, is generally "in the months of May and June". You must realize this is the precise time of year that birds of prey are nesting. There could be no worse time to spread a non-selective poison such as compound 1080 over the land on which these birds live. Wiping out present and future generations of birds which feed on ground squirrels will only pave the way to total dependence on more poisons in the future, rather than back to a sensible biological control, with a little help as needed.

Having spent 4 years in the Military, I feel qualified to generalize that the average shop on base is sometimes undermanned, and sometimes overmanned. Right? Diphacinone as stated, is labor intensive. Right again? Obviously, I am suggesting using the spare

2 troops in jeeps, on horses, by foot, etc, to place the diphacinone where needed, and carbaryl dust for flea control.

Page 145

3 I would support the use of .22 caliber rifles as a follow up in future years. I would have much preferred shooting ground squirrels rather than the human silhoutte, when I was in.

To satisfy the ranchers, you will have to control the ground squirrels - Somehow.

To continue good relations with the average citizen, it will have to be a way which is in keeping with the environmental quality which will help, rather than exacerbate the situation.

Thankyou.

Very Sincerely,
Michael G. Sauber
Michael G. Sauber

1. Evidence is lacking that 1080 used in squirrel control has had any adverse effect on raptor populations.
2. Diphacinone used for ground squirrel control will not be free of all hazards. See diphacinone on open range section, page 134.

4070 University Rd.
Hopland, CA 95449
10 March 1977

Col. Charles L. McNeill, Director
Facilities Engineering
Headquarters, 7th Infantry Division
and Fort Ord
Department of the Army
Fort Ord, CA 93941

Dear Col. McNeill:

I wish to submit the following statement in response to the "Announcement of Public Hearing for Department of the Army, Draft EIS for Ground Squirrel Control, Fort Ord Complex," of 1 February 1977.

I am presently a graduate student and candidate for the degree of PhD. in ecology from the University of California at Davis. My area of study has been the ecology and management of wildlife populations. I hold a B.S. degree in biology from the University of Redlands and a M.S. in ecology from the University of California at Davis. In addition, I am a member of the Sierra Club.

I was in attendance at the public hearing in King City on 24 February 1977, but I did not submit a statement at that time. Concerning the oral statements made at that hearing, to me the only thing more surprising than the lack of factual information was the almost total absence of sound logic displayed by many of the speakers.

I have read the draft EIS and find it to be generally adequate in evaluating the effects of the proposed action and possible alternatives. I would, however, submit the following additions and clarifications:

Page 90 1

1. Reference to various persons whose comments or opinions are cited (pp. 82-83, for example) should state their full names or at least their first initials (e.g. Dr. John W. Menke, Dr. William M. Longhurst, Dr. Harold H. Biswell). This practice should be applied to the list of persons consulted, also (pp. 221-223).

Changed, Page 173 2

2. On p. 156, in the last paragraph, lines 8 & 9, the sentence which reads "The only time the hazard is present..." is in error. I believe the intention must have been for it to read "The only time the hazard is not present..." and I suggest the following clarification be included: "The only time the hazard is not present is in pocket gopher control, because the treated grain bait is placed underground within the burrow system of the target species."

Page 179 3

3. Statements regarding the degree to which non-target species might be subjected to hazards of secondary poisoning could be expanded to include more specific information on species of particular concern. For example, the mountain lion does not generally feed on carrion (Caras 1967). Carcasses of poisoned squirrels which might remain above ground quickly would become undesirable food items for lions, particularly in warm weather. For this reason, the chances of lions being poisoned by feeding on squirrel carcasses are low.

Further, a distinction between the possibility of losses of individual predators or scavengers versus the significant reduction of populations of these species, as a result of secondary poisoning, should be made. Those persons who are opposed to the use of poisons because of possible (although small) secondary hazards may fail to realize that most species are able to compensate for loss of a certain portion of their population (rare or endangered species may be an exception). This is achieved through changes in birth and death rates. Coyote populations, for example, can probably sustain an annual removal of nearly 70% of the individuals without being driven to extinction (Connolly and Longhurst 1975). Although losses of some non-target animals will occur, it is unlikely that populations of these species will suffer any adverse long-term effects as a result of the proposed control program.

In my opinion, the proposed action is a reasonable way in which to deal with the ground squirrel problem. Man, through modification of the environment, has created a situation in which the ground squirrels have prospered and become so abundant that they are now detrimental to the habitat of other wildlife and to man. The toxicant 1080 is the most selective and effective material for which methods of application have been developed for the control of ground squirrels in an open range situation. Some persons have suggested large scale use of the anticoagulant diphacinone in place of 1080. It should be pointed out that methods for applying it to an open range situation have not been thoroughly developed, and the expense of this approach might be considerable. Furthermore, the hazards of secondary poisoning by this compound are not well known. Diphacinone can have secondary effects; it has been used in Latin America for vampire bat control utilizing this principle. Livestock can safely be treated with the compound, but vampire bats feeding on treated animals will receive a fatal dose of anticoagulant (Thompson, Mithcell, and Burns 1972). Additionally, recent unpublished research suggests that coyotes are highly susceptible to secondary poisoning by diphacinone.

In conclusion, I wish to lend my support for the statements in the draft EIS (pp. 193-194) which emphasize the need for a thorough surveillance, monitoring, and testing program to be undertaken if and when ground squirrel control is conducted.

Sincerely yours,

Robert M. Timm

Robert M. Timm

References Cited:

Caras, Roger A. 1967. North American Mammals. Meredith Press, New York. 578 pp.

Connolly, Guy E. and William M. Longhurst. 1975. The effects of control on coyote populations. Univ. of California Agric. Exper. Sta. Bulletin No. 1872. 37 pp.

Thompson, R. D., G. C. Mitchell, and R. J. Burns. 1972. Vampire bat control by systemic treatment of livestock with an anticoagulant. Science 177:806-808.

TESTIMONY OF JUDSON E. VANDEVERE OF 93 VIA VENTURA, MONTEREY AT THE FEBRUARY 24, 1977 - 1080 DRAFT EIS HEARING IN KING CITY, CA.

The Relationship between Grazing and the Presence of Ground Squirrels

1 I am concerned that the EIS contains no data on the effect of ground squirrels on the range grasses, but simply states without documentation that they have an adverse effect on the range. In reviewing grazing conditions (p. 81), the EIS states that in 1953 the range at Hunter Liggett was in good condition, although overgrazed in some areas. A teeming population of ground squirrels was present. In 1971 parts of the area were losing density and the reservation was considerably overstocked. In 1973 Dr. Leopold reported the range severely overgrazed; and Dr. Longhurst, the same year, discussing range management possibilities, did not include ground squirrels as a factor. Yet (p. 83) the EIS concludes that "ground squirrels have removed a significant ground surface area from production and consume a significant amount of forage . . ." I would like to know how much area and how much forage is a significant amount, and how it is determined that ground squirrels are responsible. When the range is overstocked with Cattle, how can it be assumed that range deterioration is due to the squirrels?

The Emergency Use of Toxicants Causing Secondary Poisoning

2 As stated in the EIS, Executive Order 11870 prohibits field use of chemicals which cause secondary poisoning, and Section 3b provides for exemption to this order when "an emergency exists that cannot be dealt with by means which do not involve use of chemical toxicants, and that such use is essential." (p. 95). Without getting into the question of the seriousness of the public health problems in areas of human use, I cannot find any justification in the EIS for such emergency use on the open range, or in the buffer zones described under Alternative 2 adjacent to private property adjoining Hunter Liggett and Camp Roberts. Squirrels on the open range do not pose a health threat to humans, since it has been stated that the reservoir of plague is in other animals than ground squirrels. In case an outbreak occurs on the open range, the presence of sick or dead animals is a warning of the disease (p. 77). The position of the California Dept. of Public Health (pp. 76-77) is that their work is easier if ground squirrels are not poisoned. Ground squirrels in the areas adjacent to private property, although they may be an economic problem, obviously do not pose a public health emergency. On pp. 97-99 of the EIS, the Council of Environmental Quality *found no emergency justification for* the use of 1080 or of DDT for fleas; and the EPA advised against the use of 1080 unless other means are shown to be ineffective. The Army apparently recognizes the hazards and follows these recommendations near human habitations, yet wants an exemption from the Executive Order so they can use chemicals which cause secondary poisoning in areas where there is not a public health problem. This is directly contrary to the Army official position (p. 110) that "a threat to human health is the only reason to use toxicants having secondary effects."

1. **Dr. Menke, an authority on range management, has not rated the range as overgrazed. He has indicated that there is heavy utilization and predicts heavy local over-utilization on level land, with riparian habitat suffering some degradation. See page 92.**

2. **The animals Microtus spp. and Peromyscus spp., which are thought to be the reservoir of plague do differ from those animals (i.e., squirrels) responsible for its transmission to man. Squirrels on the open range if infected with plague would pose a public health threat especially to the military personnel which maneuver or bivouac in the open range areas.**

February 24, 1977

Col. McNeill, Director
Facilities Engineering
Fort Ord, CA.

Dear Col McNeill:

This report is in response to the EIS issued February 4, 1977 on the proposal to control Ground squirrels at the Fort Ord Complex.

408 Attached are three pages listing specific errors, omissions, and comments on the EIS.

In general I would like to note: The EIS does not substantiate the risk of *Pasteurella pestis* to the human population. The EIS gives inadequate information on the risk (and number of deaths) to non-target species. Seed eating birds as well as endangered or protected species would be killed, yet no mention is made of the numbers of individuals involved.

As near as I have been able to determine grazing, hunting and military activities have been taking place at Hunter-Liggett and Camp Roberts inspite of the presence of *Pasteurella pestis*. The only measure that is presently being undertaken is the use of carbaryl dust. There has not been a single case of bubonic plague in Monterey Co. It would appear that carbaryl dust is an adequate protection.

As an alternative to the proposed action suggested in the EIS, I would urge that you:

1) Reduce the level of grazing on the Fort Ord complex

2) Eliminate grazing where serious damage has occurred to vegetation

3) Quarantine areas where dead squirrels have been found

4) Dust areas of human use with Carbaryl.

address
Box 1001, Salinas CA.
93901

Sincerely,
Dr. Marilyn Vassallo
B.A., M.A., Ph.D. Physiological-Ecology

409

Errors & Omissions

Changed 1 ix — sylvatic and bubonic plague are not synonymous terms.

2 — Omission: grazing and overgrazing of cattle results in increased ground squirrel populations, which result in damage to military structures and cropland.

Changed 3 xi — Dove hunting is significant in this area and therefore should have been included in paragraph 3.

4 — Error: The loss of ground squirrels is not significant because of their habits of aestivation and hibernation.

Comment: Ground squirrels form a significant source of food to many predators in spite of their seasonally inactivity. Predators: Golden Eagle, Red-tailed Hawk, Ferruginous Hawk, Badger, Weasel.

Error: (The loss of "other rodents" to predators is not significant.)

Comment: Rodents form a significant food source to many predators and are a major link in the grassland food chain. Predators: Golden Eagle, Red-tailed Hawk, Marsh Hawk, Prairie Falcon, Kestrel, Horned Owl, Screech Owl, Barn Owl, Gray Fox, Bobcat, Skunk and Ring-tailed Cat.

Changed 5 3 — Paragraph 3. Rodents carry fleas with Pasteusella pestis which expresses itself as sylvatic plague in infected squirrels and bubonic plague in humans.

Changed 6 11 — Omission: Sierra de Salinas should be included in paragraph 2.

~~76 Omission: citation for Lockner, 1976 not listed in Bibliography~~ Found.

7 121 — The option of stopping grazing to reduce squirrel populations is omitted. The effectiveness of this approach should be analyzed. In addition there is no heading on Effectiveness of Minimized Damage to Wildlife.

Noted 8 155 — Quail and doves are susceptible to 1080 and important to hunters. They should be included in a discussion of direct poisoning of non-target species.

9 157 — Point number 4 implies there is a dilution affect when predator takes an animal with a sublethal dose. In fact, there is a magnifying affect (The Principle of Biological Magnification) because the predator tends to take many individuals with sublethal doses (not just one as this statement implies). This point should be combined with number 5.

Changed 10 158 — California Department of Agriculture, 1973; not cited in Bibliography.

11 197 — Paragraph 5. *In terms of poisoning and reduction of food supply, the kit fox* is not the only rare or endangered species that could be affected. Secondary poisoning from 1080 could affect the Peregrine Falcon, Golden Eagle, and Ring-tailed Cat (protected). Reduction of food supply could affect the Golden Eagle, Peregrine Falcon, Ring-tailed Cat and Kit Fox.

12 — No LD50 for the Condor is listed. What is the LD50 for the Condor?

13 — Fort Ord: animals inhabiting ground squirrel burrows some of which are protected species may be affected. Protected species that may occur in the area of zinc phosphide use: coast Horned Lizard, California Legless Lizard, San Joaquin Whipsnake.

Changed 14 146 — Omission: No mention of use of diphacinone at Hunter-Liggett.

Comments and Rebuttals

15 x — Summary of impacts does not mention affects on hunting: dove, quail, wild boar (who scavenge on dead organisms).

16 1 — Paragraph 2. Repeated use of poisons leads to a need for higher doses and eventual immunity by the target species.

17 64 — Paragraph 4. "From 1940 to 1970, 13 cases with 5 deaths have been recorded. All of them from the bubonic form."

Comments: given the frequency of squirrel epizootics and the large human population, this would appear to be a very low level. Do such infrequent occurences warrant spraying highly toxic stable chemicals over a wide area?

18 123 — "Anticoagulant baits may also be effectively used around buildings and other structures at this time of year."

Comment: Anticoagulants may also be used on open range at this time of year.

19 125 — "Saito... *analyzed streams over a 5-month period and found no trace of 1080.*"

Comment: When DDD was sprayed on Clear Lake, no trace of the chemical was found in the lake two weeks after spraying. It was later found that it was rapidly taken into the food chain.* Evidence that 1080 is absorbed by plants was reported by Hilton, et al. 1969.

20 125 — "There is no evidence that hazardous amounts of 1080 can accumulate in the meat of carcasses for human consumption (Peters, 1975)"

Comment: What is meant by "hazardous"? Throughout this EIS, the only affect of 1080 that is considered is death. There is no mention of the physiological effects of sublethal doses. (as for example, reproductive failure caused in Grebes by DDD at Clear Lake.)

There is also no mention of possible synergistic effects with other chemicals present in human tissues.

21 137 — "Elimination of grazing would not be a feasible alternative...."

Comment: Reduction of grazing would reduce the ground squirrel population and also function to reduce the fire hazard.

22 149 — Paragraph 2: What evidence is there that the soil organisms and environmental conditions in Peter's study will be effective in degrading 1080 under the soil and climatic conditions of the Salinas Valley area?

* Ref. p. 197 Paul & Anne Ehrlich. Population/Resources/Environment. 1972 (2nd Ed) W. H. Freeman Press.

23 153 Paragraph 1: "The potential of primary poisoning of nontarget species depends on... The ability of the species to detect early symptoms and stop feeding prior to ingesting a lethal dose...."

Comment: If a non-target species does not receive a lethal dose, it can still contribute to secondary poisoning of other species.

24 155 Paragraph 4: "Grey squirrels... are also quite tolerant to 1080."

Comment: "Tolerance" of an organism allows a substance to concentrate at the higher trophic levels leading to lethal doses or disruption of physiological processes.

25 170 Paragraph 5: Evidence has already been cited on page 125 that 1080 is absorbed by plant roots and transported to leaves. It would appear from this statement that 1080 is not "held" in the soil.

26 170 Paragraph 5: (Studies indicate no toxicity after two weeks when applied at 10 ppm and no toxicity at 11 weeks when applied at 50 ppm).

Comment: The application of 1080 at Hunter Liggett will be a concentration of .08%. Is not this substantially more than 50 ppm? (.08% = 8000 ppm?)

27 172 Paragraph 4: (Dogs were unaffected after injesting mice who had eaten warfarin).

Comment: What is meant by unaffected? Death did not occur? No short term or long term physiological affects? No hereditary effects?

2.* There is evidence that even moderate grazing may increase ground squirrel numbers. Total cessation of grazing is not feasible.

4. None of the species mentioned are host specific. Their diets are made up many species other than squirrels. The removal of 90 percent of the squirrels and a small percent of other small rodents will not influence the predators any more than if 90 percent of the squirrels were to die of plague.

7. Cessation of grazing is not feasible due to fire control alone, in addition to the value of raising livestock. See pages 87 and 94.

9. Biological magnification is not an issue with compounds that do not accumulate.

12. The current status of the California condor makes it unavailable for laboratory studies to determine its LD_{50}.

13. Zinc phosphide as used will not affect snakes or lizards.

15. See response number 10 - U. S. Department of the Interior comments.

16. Repeated sublethal doses of 1080 have increased the tolerance of some species to subsequent challenging doses (Atzert, 1971); however, this effect appears to be short-lived and of minimal significance in the use of 1080 as a rodenticide.

17. Hazards to public health should be reduced or prevented. Toxic chemicals will be placed only in areas of dense squirrel colonies, not "sprayed over a wide area".

18. The need for repeated use of anticoagulants (multiple doses) on the open range to achieve effective control makes the cost of this method prohibitive except for small-scale use.

19. Biological magnification does not occur like that which is associated with DDD.

20. See page 129 of EIS, changes made: "Hazardous" as used referred to death; however, humans who have survived various doses of 1080 are not known to have any lasting physiological effects.

21. Reduction of grazing would not reduce the fire hazard. We recommend that a study specifically designed to demonstrate the role of squirrels and grazing be conducted at the Fort Ord Complex. There is evidence that disturbance of the soil by military maneuvers, roads, etc., may encourage large squirrel population.

22. There have been no studies conducted in the Salinas Valley to determine the effectiveness of soil organisms degrading 1080. See page 130.

23. There is no evidence that sublethal doses of 1080 in one animal contribute to secondary poisoning in other species. This is not surprising since 1080 is eliminated over a period of time by animals receiving sublethal doses. 1080 is not considered as cumulative to any practical degree (Crabtree, 1962).

24. There is no evidence that tolerance of 1080 leads to concentrations at the higher trophic levels.

25. There is abundant evidence that sodium monofluoroacetate can be degraded into non-toxic components (Peters, 1975). Therefore, any sodium monofluoroacetate leached into the soil will be decomposed by bacteria; it is not held in the soil per se.

26. An application rate of 2.5 kernels per sq. ft. (6 pounds/acre) of .08 percent 1080 would not exceed 50 ppm even if it were mixed with only the top 1/4 inch of soil.

27. From the study, it would be concluded that no deaths or gross symptoms occurred. Warfarin has been used for years in human medicine and it definitely has physiological effects. Some are considered beneficial, others are not.

CF: D/E Sec
4 Mar

San Miguel, Calif.
February 23, 1977

Dear Sir

I am a farmer and own land joining Camp Roberts.

411

During recent years there has been a dramatic increase in the squirrel population within the Camp boundaries.

I understand there has been no attempt to control them due to the executive order banning the use of poison bait containing the compound 1080.

My first knowledge of 1080 was in the middle 1940's when the army treated a large area of the Camp and including acreage that I farmed some four miles east of the Camp proper.

(2)

Very good control was achieved from that operation

At that time and for some years later the area treated was designated as plague Area

Since the mid 1940's we have used the 1080 baits for the control of squirrels on our land.

The County supervises the use of this bait and it is not always available, so when I couldn't get 1080 I used other baits (strychnine + Zinc) Results using these baits were discouraging. The 1080 baits ~~had~~ have been consistently more effective.

Noted

After some thirty years of using the 1080 baits we still have a few ground squirrels. I can see no reduction in the population of our native animals, bobcats, skunks, racoons, rabbits, fox

(3)

badgers etc.

If the squirrel population on the Camp Roberts, Fort Ord properties is allowed to continue multiplying, I am concerned that they will become a real threat to the health of both the troops stationed there and to the citizens in the joining area

Sincerely
Arthur Von Dollen

Mrs. Edward P. Wells
Box ~~XXX~~ 156
The Sea Ranch, California 95497

March 16, 1977

Office of the Director of Facilities
Department of the Army
7th Infrantry Division
Fort Ord, CA 93941

Dear Sir:

My husband and I were dismayed to learn that the poison 1080 may be used again.

We realize the problems of a plague of ground squirrels, but think that the cure (if it is 1080) is worse than the disease. In addition to the fact that many ground-squirrel predators - including endangered species - would be killed secondarily, pet dogs would be likely victims.

1 When we lived in Minnesota many years ago we had a pet ferret that we put down rabbit holes. It would return to our (gloved) hands when we scratched on the soil near the mouth of the hole. (We sometimes had quite a wait!) I wonder if ferrets could be used on ground squirrels. Perhaps the ferrets are too large, though they can stretch out to be quite slender. How about gopher snakes?

Anyway, we do hope and pray that you do not use 1080!

Sincerely yours,

Mary P. Wells

Mary P. Wells (Mrs. Edward P. Wells)

1. Ground squirrels have numerous enemies including gopher snakes which already exist on the Fort Ord Complex.

The use of ferrets would be infeasible in any significant ground squirrel control program.